Anritsu

SERVICE MANUAL

DS-3 TRANSMISSION ANALYZER

ME462B

Anritsu

SERVICE MANUAL

DS-3 TRANSMISSION ANALYZER

ME462B

1990.04 x 60 NV-11(Y)
Printed in Japan

CERTIFICATION

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Anritsu further certifies that its calibration measurements are based on the Japanese Electrotechnical Laboratory and Radio Research Laboratory standards.

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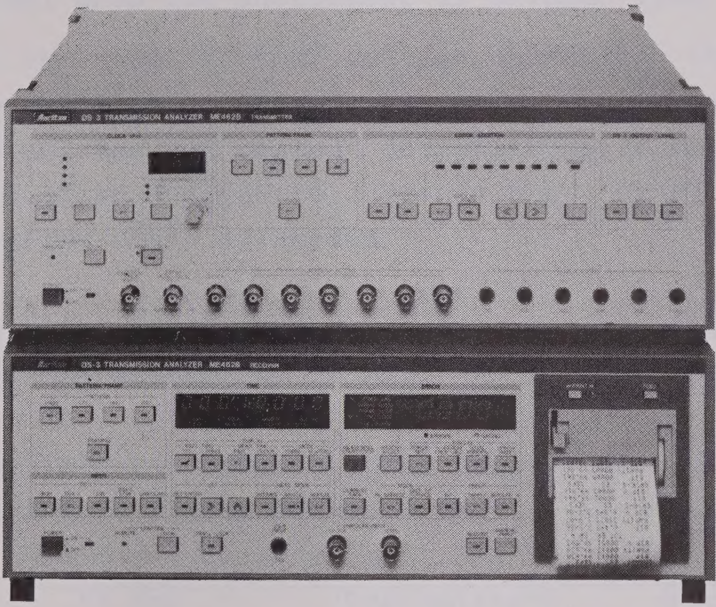
Anritsu
DS-3 TRANSMISSION ANALYZER ME462B TRANSMITTER
CLOCK
PATTERN/FRAME
ERROR ADDITION
DS-3 OUTPUT LEVEL
Anritsu
DS-3 TRANSMISSION ANALYZER ME462B RECEIVER
PATTERN/FRAME
TIME
ERROR
POWER

NOTE

(1) The instrument is operable on a nominal voltage from 100 to 127 Vac or from 200 to 250 Vac by changing the connections of the power transformer taps.

The voltage and current rating are indicated on the rear panel when the instrument is shipped from the factory.

In the case of other voltage operation, change the connections of the power supply transformer, and the plate of voltage and current designations on the rear panel should be changed to suitable one. Order the plates from ANRITSU CORP. if needed.

(2) In this manual, a power supply voltage and current rating are represented by ** Vac, *** A, and **** A.

(3) The relation between power supply voltage and current rating is listed below.

** Vac	(Transmitter) *** A	(Receiver) **** A
100 to 127 V	2 A	2 A
200 to 250 V	1 A	1 A

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SECTION 1

GENERAL

This is the Service Manual for the ME462B DS-3 Transmission Analyzer. It covers the following information:

SECTION 2, MECHANICAL CONFIGURATION:

Describes how the various printed circuit boards (PC boards) are laid out.

SECTION 3, TROUBLESHOOTING:

Describes how to troubleshoot the equipment. Schematic diagrams for the equipment are given in this section.

SECTION 4, REPLACEABLE PARTS:

Explains how to order replacement parts and the component lists.

For the specifications, the operating instructions, performance check, and detailed panel control description of the ME462B, refer to the separate operation manual.

SECTION 2

MECHANICAL CONFIGURATION

2.1 Introduction

This section will explain methods of disassembling the equipment.

2.2 Disassembly

2.2.1 Separation of Transmitter and Receiver

As shown in Fig. 2-1 below, the receiver and the transmitter are locked together by 4 legs.

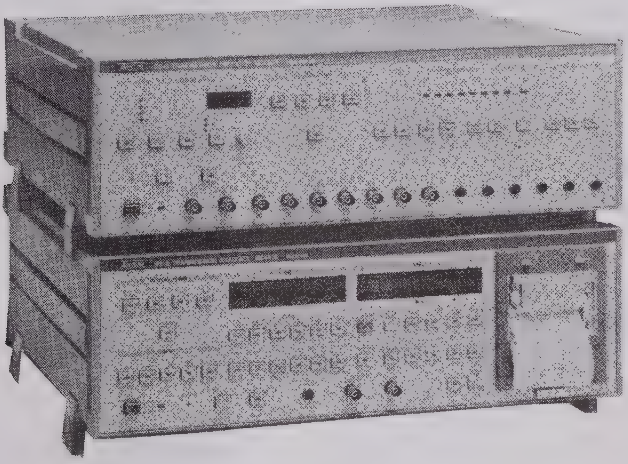


Fig. 2-1 Connection between transmitter and receiver

As shown in the detailed drawing of Fig. 2-2, the transmitter and the receiver are separated by lifting the locks.

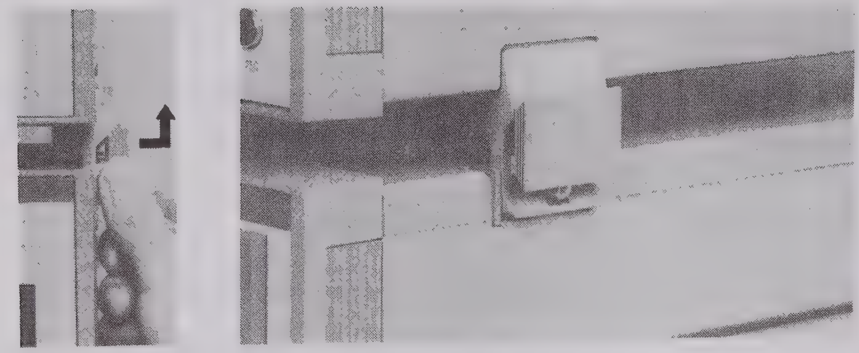


Fig. 2-2 Detailed view of leg

2.2.2 Cabinet Disassembly

No.	PART No.	DESCRIPTION	REMARKS	Q'TY
①	32B7661	Frame, Front	1MW•3U	1
②	32B7665	Channel, Rear	3U	2
③	33B20662	Protector		4
④		NOT ASSIGNED		
⑤	32B7668	Channel, Top	350D	2
⑥	32B7669	Channel, Bottom	350D	2
⑦	349B73667A	Foot, Stack		4
⑧	34B73660B	Tape, Trim	3U	2
⑨	349B73661B	Handle, Side	350D	2
⑩	33B22451	Cover, Top		1
⑪	33B22511	Cover, Bottom		1
⑫	33B22469	Cover, Side		2
⑬	4BPS8S3	Screw		2
⑭	4BPS8S3	Screw		2
⑮	5FPS12S7	Screw		4
⑯	5FPS10S7	Screw		8
⑰	4NPS20S7	Screw		8
⑱	4SW-SU	Spring Washer		8
⑲	4WBS-B3	Plain Washer		12

(1) Removing the top cover ⑩

Remove the two screws ⑬. Then, remove the top cover ⑩ by lifting it from rear in the direction indicated by the * arrow.

(2) Removing the bottom cover ⑪

Remove the two screws ⑭. Then, remove the bottom cover ⑪ from in the rear as indicated by the * arrow.

(3) Removing the side cover ⑫

Open the cover of the handle ⑨ in the direction indicated by the * arrow and remove the two screws ⑮. Then, remove the side cover ⑫.

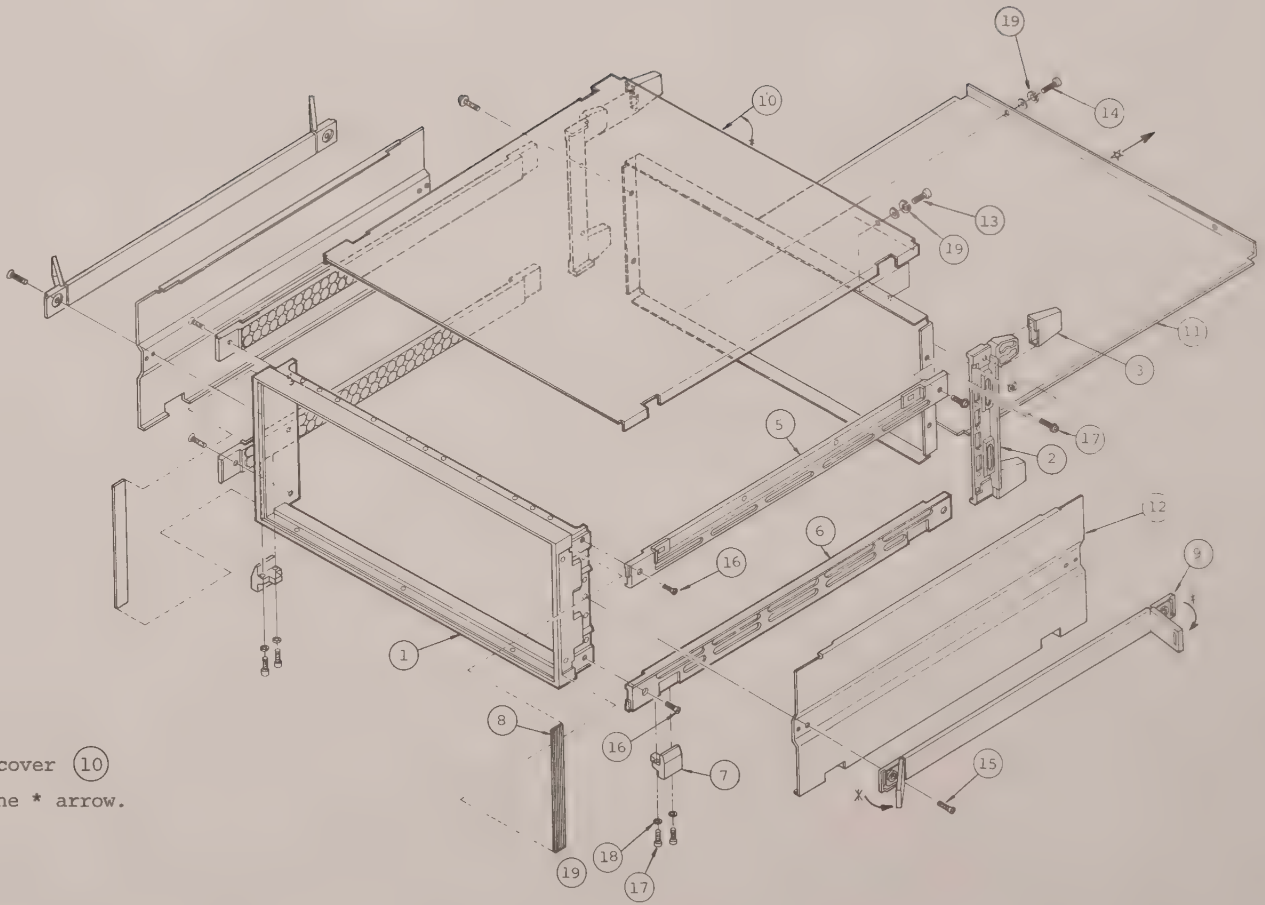


Fig. 2-3 Cabinet Disassembly

2.2.3 Transmitter Disassembly

NO.	PARTS NO.	DESCRIPTION	REMARKS	Q'TY
①	42B10697	Front Panel		1
②	422B10698	Plate, Sub-panel		1
③	422U10935	Z2 P.C. Board		1
④	422U10870	Z4 P.C. Board		1
⑤	44B76849	Filter		1
⑥	34B78330A	Clamp, Panel		3
⑦	34B78330B	Clamp, Panel		3
⑧	342E73701	Knob		1
⑨	44E68583	Button	Character; POWER	1
⑩	442E81136C	Button	Character; >	2
⑪	44E80830A	Button	Character; F1-F4 LOCAL, MODULATION, SINGLE	4
⑫	442E80831A	Button		15
⑬	3FPS10B3	Screw		6
⑭	3FPS8B3	Screw		5
⑮	3NPS6B3+SW	Screw		17
⑯	3NPS10B3+SW	Screw		5
⑰	3A0S3	Screw		1

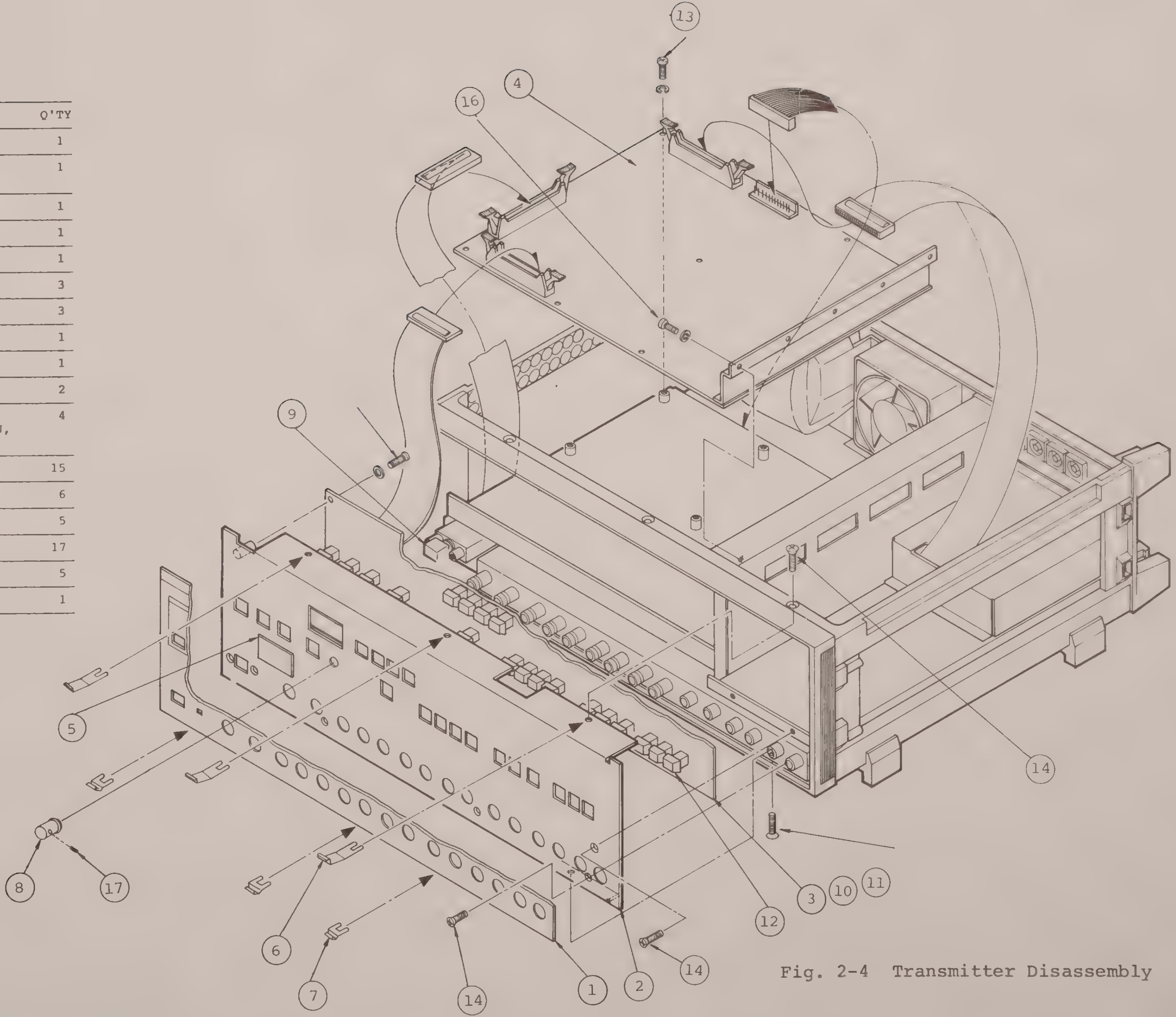
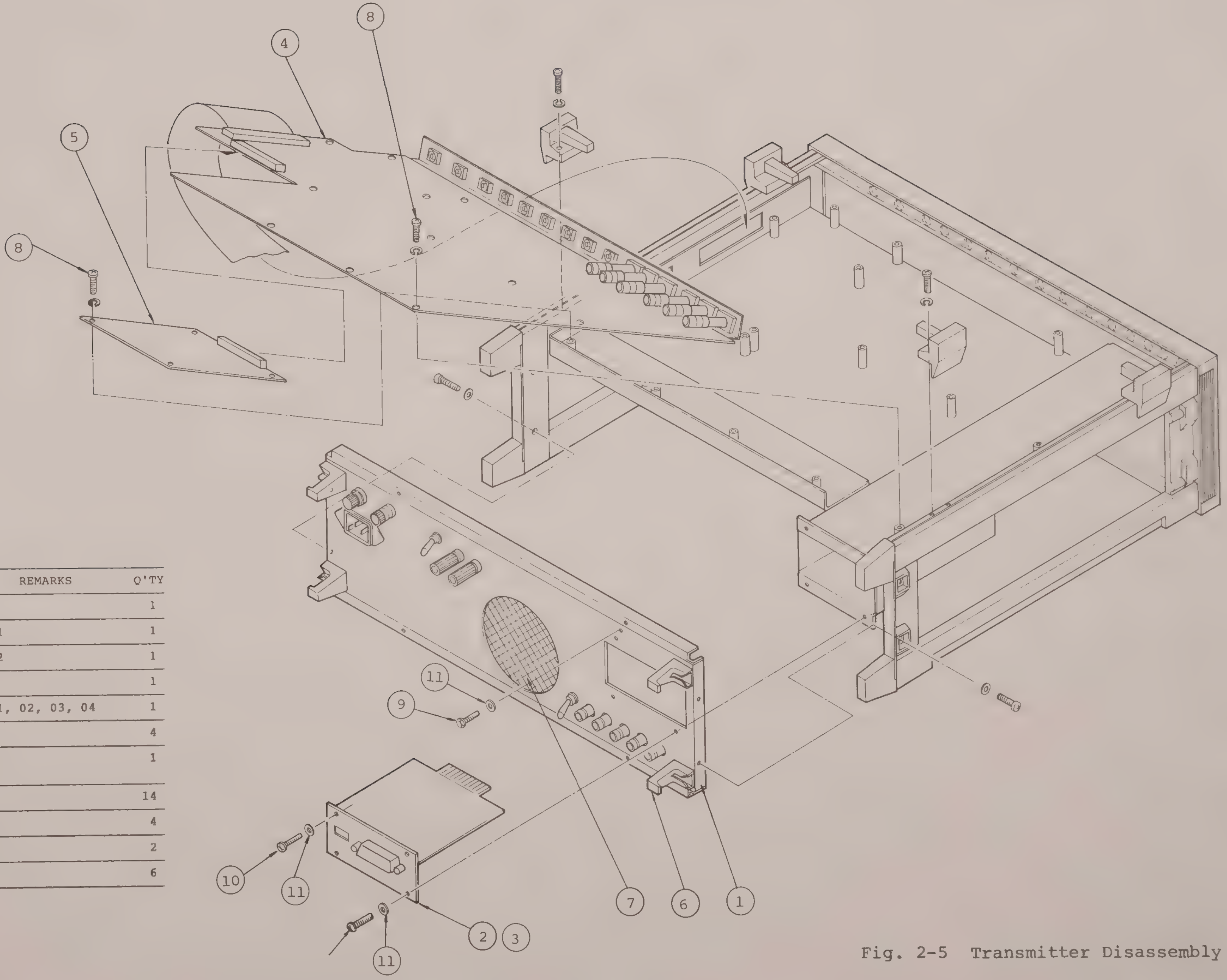


Fig. 2-4 Transmitter Disassembly



NO.	PARTS NO.	DESCRIPTION	REMARKS	Q'TY
①	42B10707A	Rear Panel		1
②	44Y78601A	GP-IB	OPT21	1
③	44Y78601B	RS-232C	OPT22	1
④	422U10937	Z3 P.C. Board		1
⑤	442U78588	Z5 P.C. Board	OPT01, 02, 03, 04	1
⑥	34B73670	Cord Holder		4
⑦	34B64690	Protective Mesh Cover		1
⑧	3NPS6B3+SW	Screw		14
⑨	3BPS10B3	Screw		4
⑩	3NPS8B3+SW	Screw		2
⑪	3WBS-B3	Plain Washer		6

Fig. 2-5 Transmitter Disassembly

2.2.4 Receiver Disassembly

NO.	PARTS NO.	DESCRIPTION	REMARKS	Q'TY
①	42B10737	Front Panel		1
②	422B10738	Plate, Sub-panel		1
③	44B76995	Plate, Printer eject		1
④	422U10872	Z4 P.C. Board		1
⑤	422U10851	Z2 P.C. Board		1
⑥	44B76996	Filter		1
⑦	34B78330A	Clamp, Panel		3
⑧	34B78330B	Clamp, Panel		3
⑨	44E68583	Button	Character; POWER	1
⑩	442E81136A	Button	Character; ⩓	1
⑪	442E81136C	Button	Character; ≫	1
⑫	44E80830A	Button	Character; RESET, LOCAL, PRINT	3
⑬	44E80830B	Button	Character; START/STOP	1
⑭	442E80831	Button		32
⑮	3FPS10B3	Screw		5
⑯	3FPS8B3	Screw		5
⑰	3NPS6B3+SW	Screw		17
⑱	3NPS10B3+SW	Screw		5

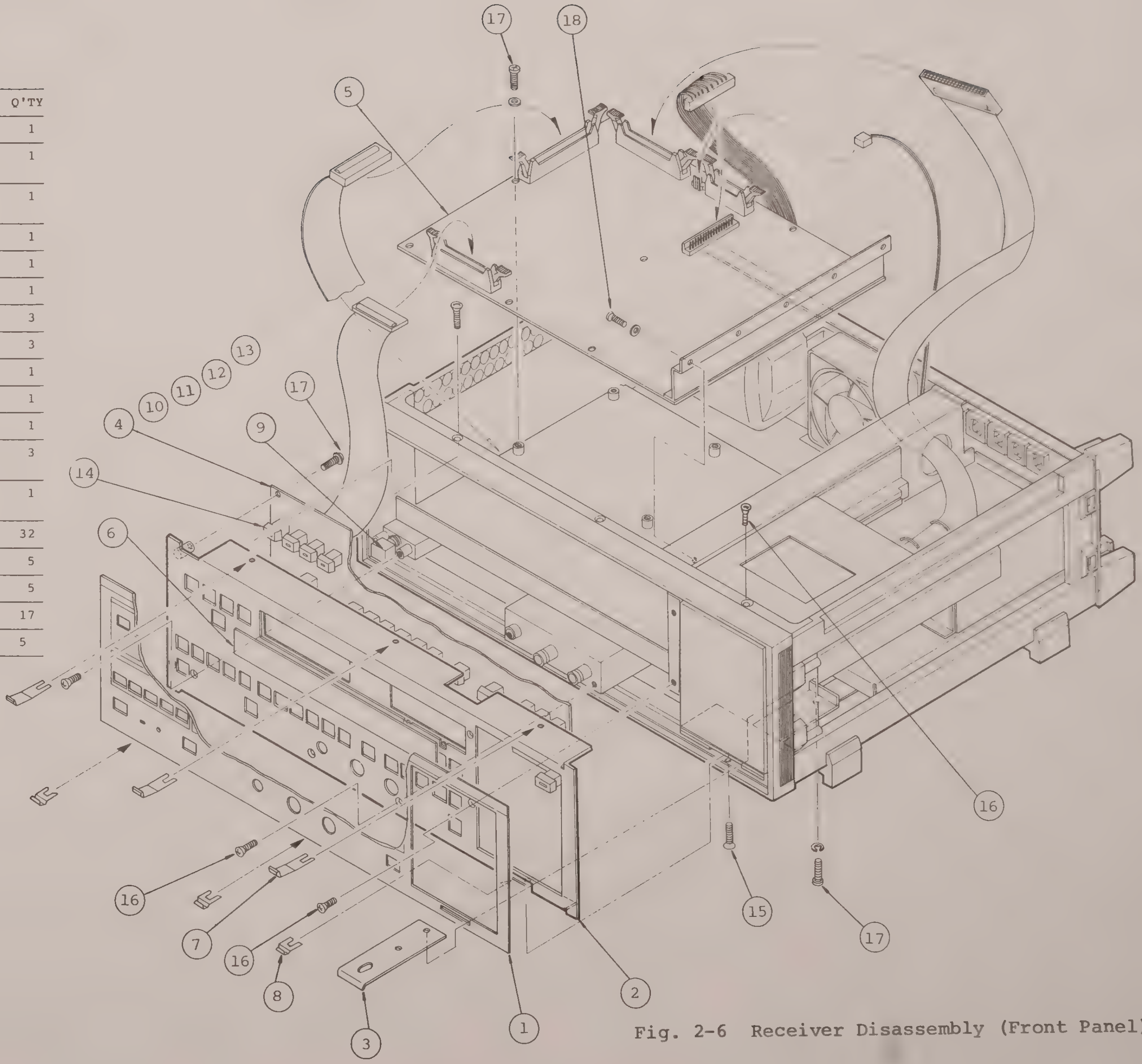


Fig. 2-6 Receiver Disassembly (Front Panel)

NO.	PARTS NO.	DESCRIPTION	REMARKS	Q'TY
①	42B10707B	Rear Panel		1
②	44Y78601A	GP-IB	OPT31	1
③	44Y78601B	RS-232C	OPT32	1
④	422U10849	Z3 P.C. Board		1
⑤	34B73670	Cord Holder		4
⑥	34B64690	Protective Mesh Cover		1
⑦	3NPS6B3+SW	Screw		12
⑧	3BPS10B3	Screw		4
⑨	3NPS8B3+SW	Screw		2
⑩	3WBS-B3	Plain Washer		6

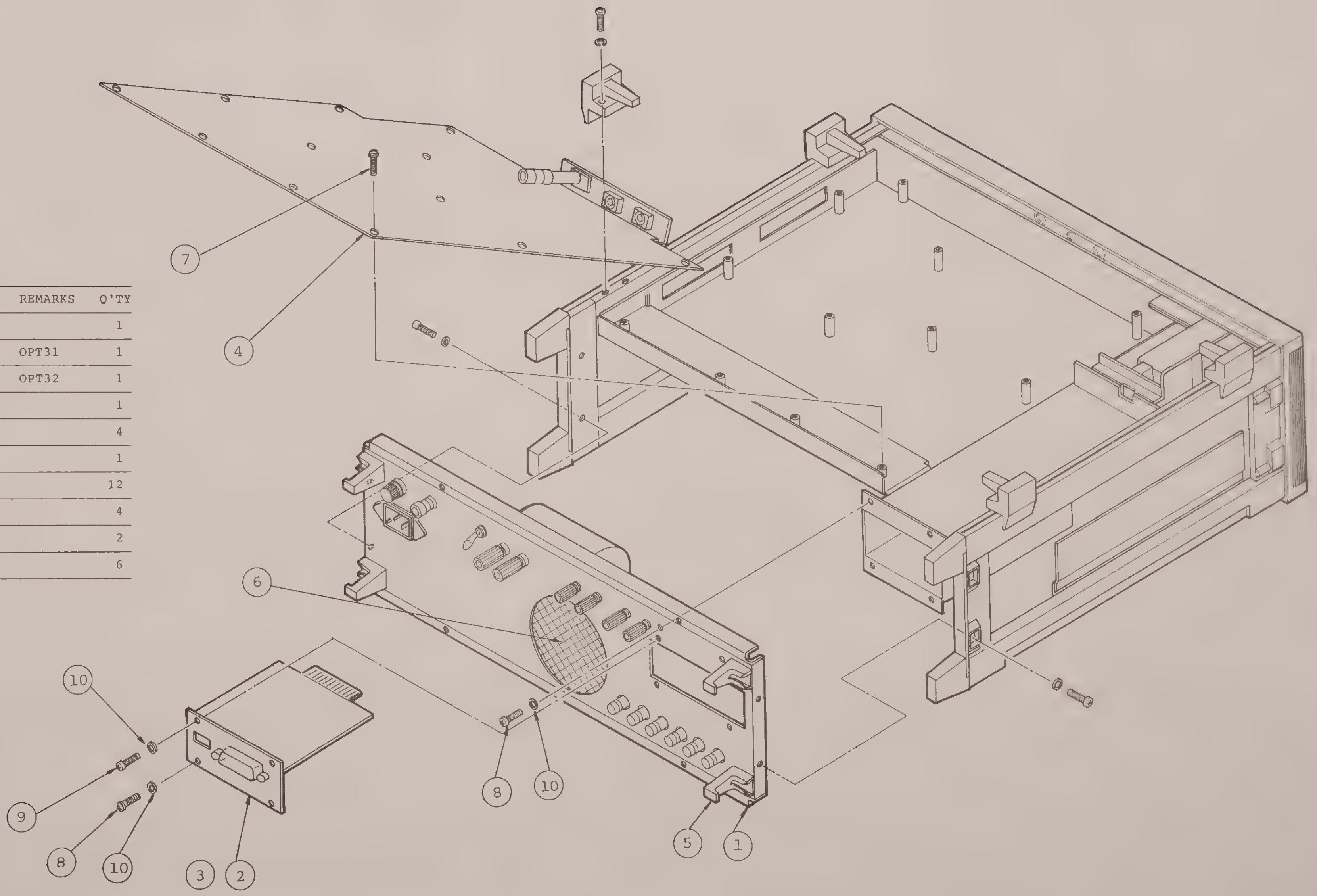


Fig. 2-7 Receiver Disassembly (Rear Panel)

NO.	PARTS NO.	DESCRIPTION	REMARKS	Q'TY
①	442B77043	Blank Panel		1
②	44Y76992	Printer	OPT11	1
③	HIF3A-20D-AA50S	J20 Cable		1
④	3NPS8B3+SW	Screw		4
⑤	4NPS8B3+SW+WB	Screw		1
⑥	3WB-B3	Plain Washer		2

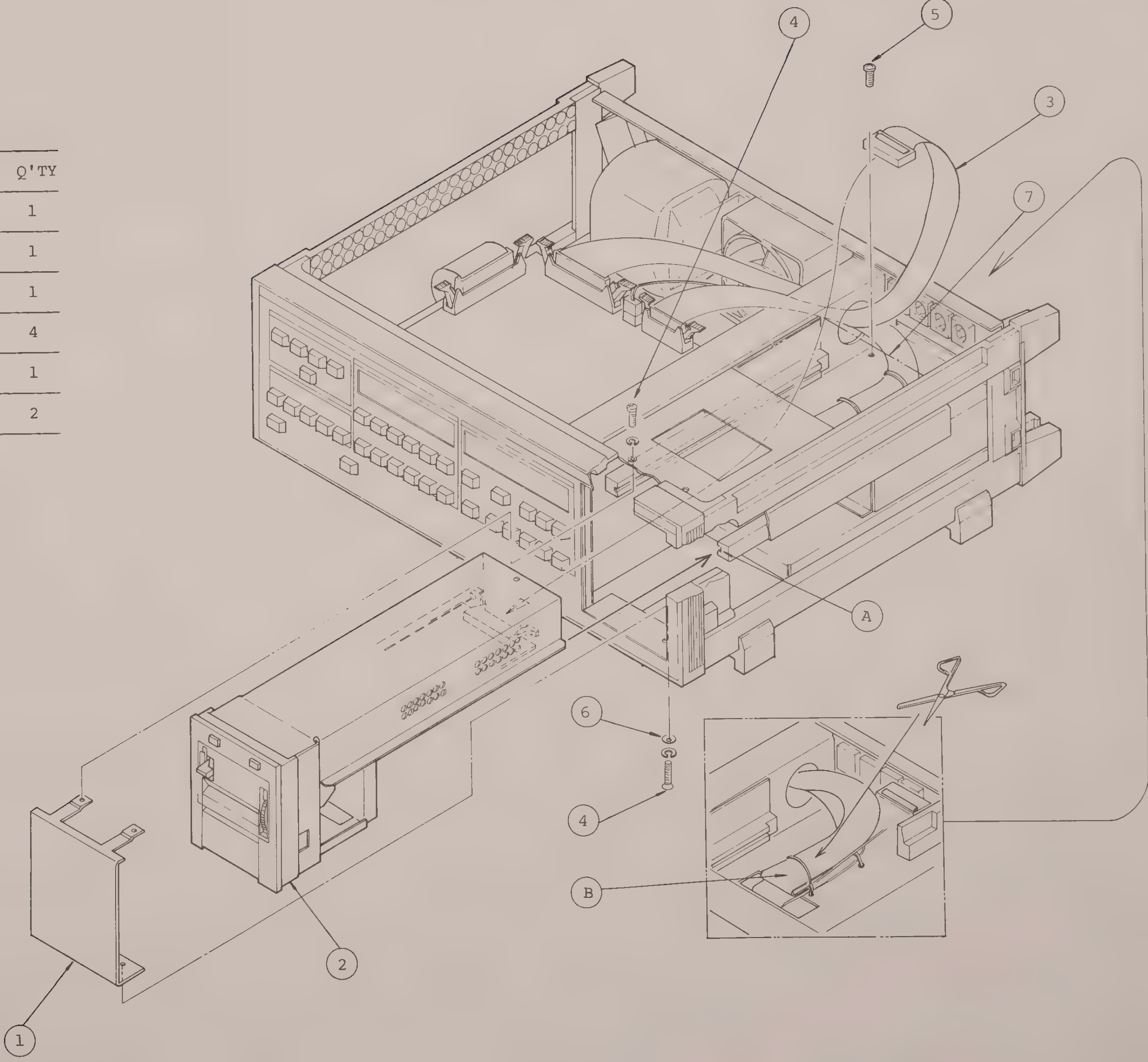


Fig. 2-8 Receiver Disassembly (Printer)

2.3 Internal Views

The following Figs. 2-9 to 2-12 show the top/bottom views uncovering the top/bottom plate of the transmitter and the receiver.

Some of the parts location (P.C. Board with Z number, J: connector, T: transformer, and G: fan) are shown with arrow.

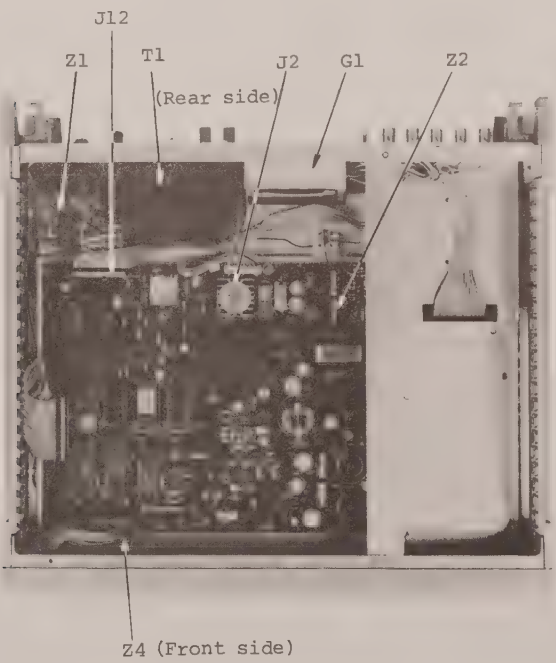

J12
Z1
T1
J2
G1
Z2
(Rear side)
Z4 (Front side)

Fig. 2-9 Top View of Transmitter

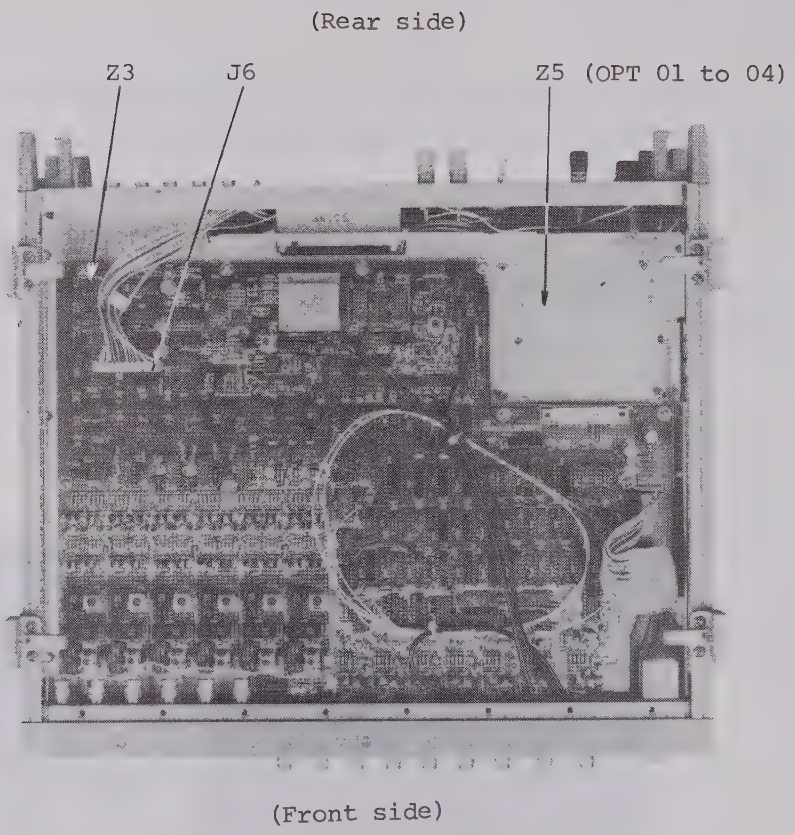

(Rear side)
Z3
J6
Z5 (OPT 01 to 04)
(Front side)

Fig. 2-10 Bottom View of Transmitter

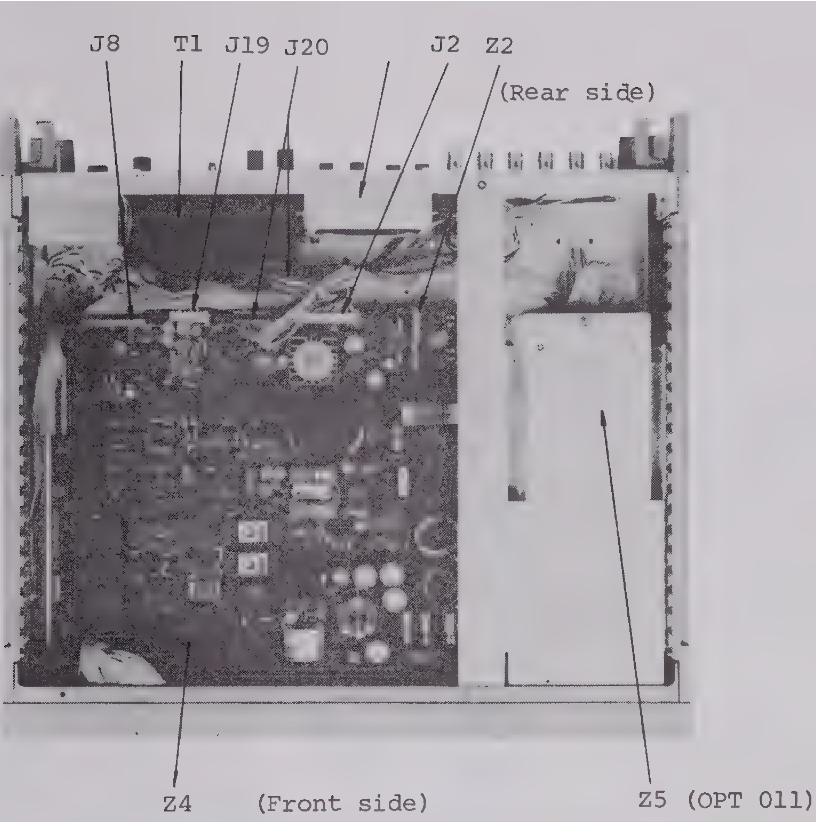

J8
T1
J19
J20
J2
Z2
(Rear side)
Z4
(Front side)
Z5 (OPT 011)

Fig. 2-11 Top View of Receiver

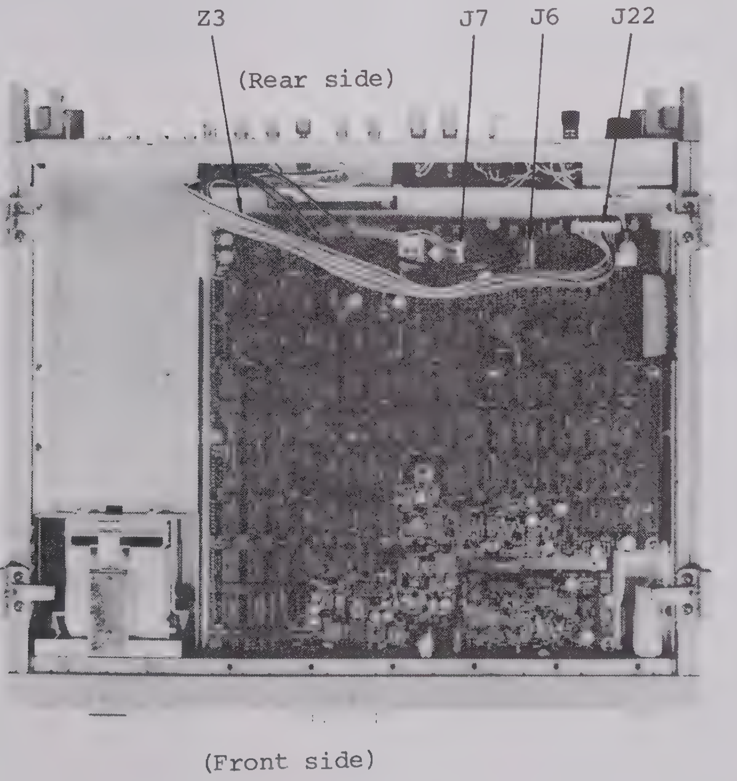

Z3
J7
J6
J22
(Rear side)
(Front side)

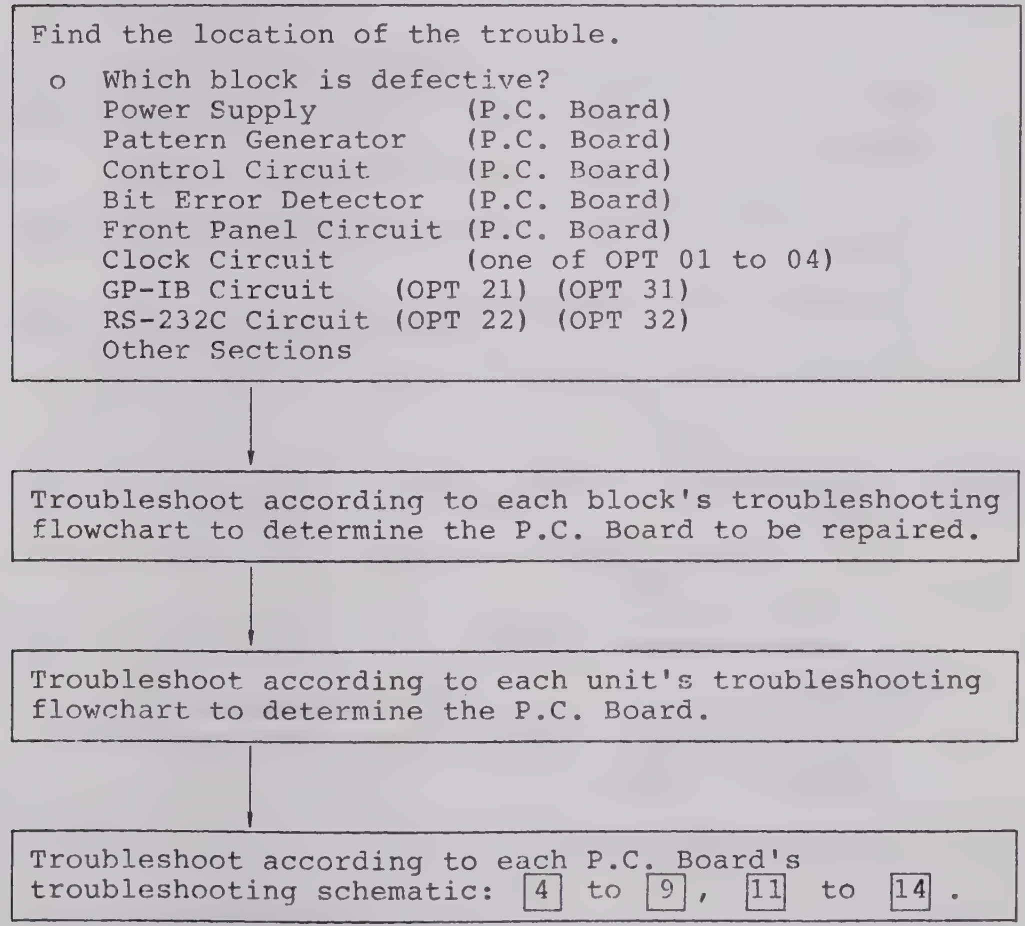
Fig. 2-12 Bottom View of Receiver

SECTION 3

TROUBLESHOOTING

3.1 Introduction

This section explains the troubleshooting procedures if the calibration shown in SECTION 4 of the Operation Manual fails. Troubleshooting can be diagrammed as follows.



Find the location of the trouble.

- Which block is defective?
  - Power Supply (P.C. Board)
  - Pattern Generator (P.C. Board)
  - Control Circuit (P.C. Board)
  - Bit Error Detector (P.C. Board)
  - Front Panel Circuit (P.C. Board)
  - Clock Circuit (one of OPT 01 to 04)
  - GP-IB Circuit (OPT 21) (OPT 31)
  - RS-232C Circuit (OPT 22) (OPT 32)
  - Other Sections

Troubleshoot according to each block's troubleshooting flowchart to determine the P.C. Board to be repaired.

Troubleshoot according to each unit's troubleshooting flowchart to determine the P.C. Board.

Troubleshoot according to each P.C. Board's troubleshooting schematic: $\boxed{4}$ to $\boxed{9}$, $\boxed{11}$ to $\boxed{14}$.

Fig. 3-1 Troubleshooting Procedure

The block diagram for ME462B $\boxed{1}$, $\boxed{2}$ will serve as the basis for troubleshooting judgements.

When a failure occurs with the equipment, each the faulty circuit is described as follows:

(1) Transmitter failure

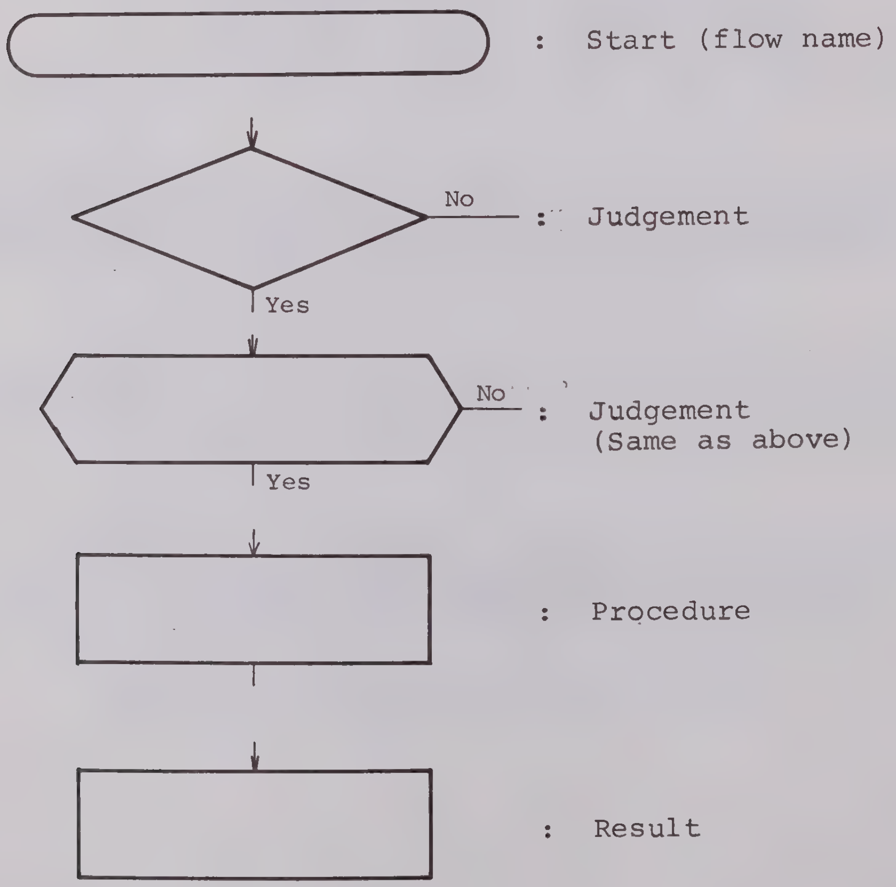
See paragraph 3.2 Transmitter Troubleshooting.

(2) Receiver failure

See paragraph 3.3 Receiver Troubleshooting.

The circled numbers in each flowchart show the check point number in the circuit diagram and parts layout Diagram.

In this flowchart, following symbols are used.


: Start (flow name)
No
Yes
: Judgement
No
Yes
: Judgement
(Same as above)
: Procedure
: Result

3.2 Transmitter Troubleshooting

When a failure occurs with the ME462B transmitter, select the corresponding item from the following Troubleshooting items and make repairs in accordance with the flow in each one.

Troubleshooting Items

(1) Power on lamp does not light.

(2) DC regulated power supply (+5 V, -5.2 V, +12 V, -2 V) is faulty.

(3) Front panel LED or key switch is faulty.

(4) Operation by external clock is faulty.

(5) Operation by F1 to F4 (OPT 01 to 04) is faulty.

(6) Jitter modulation is faulty.

(7) DS-3 output waveform is faulty.

(8) Unipolar clock output (frequency waveform) is faulty.

(9) Unipolar data output waveform is faulty.

(10) Bipolar violation is detected.

(11) Frame sync loss or parity errors are detected.

(12) Pattern sync loss or bit errors are detected.

(13) Error addition is faulty.

(14) Sync output is faulty.

(15) Control circuit is faulty.

(16) GP-IB or RS 232C interface is faulty.

3.2.1 Power-ON Lamp Troubleshooting

Refer to
- 3 Overall Circuit of Transmitter: 43W30643 (1/2)
- 4 Power Supply Circuit (Z2) : 43W30644 (1/5, 5/5)
- 6 Front Panel Circuit (Z4) : 43W30646 (3/3)

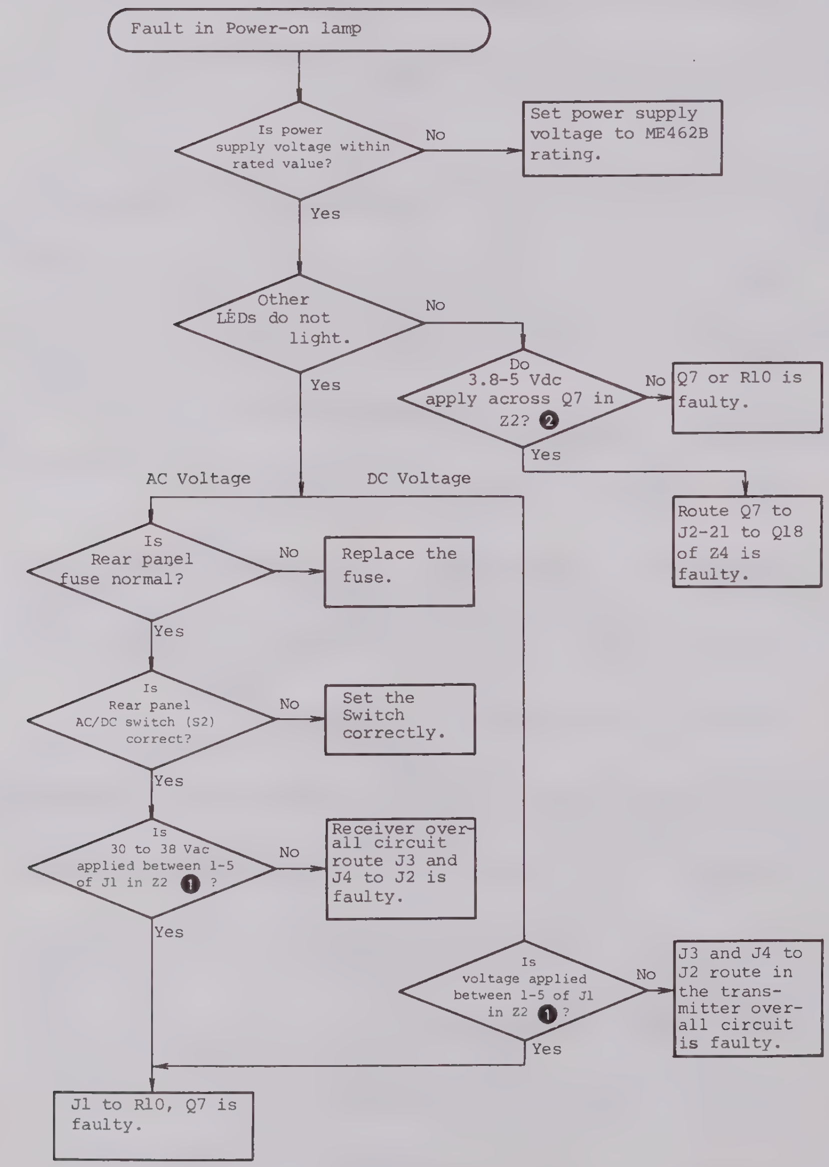

Fault in Power-on lamp
Is power supply voltage within rated value?
No
Set power supply voltage to ME462B rating.
Yes
Other LEDs do not light.
No
Do 3.8-5 Vdc apply across Q7 in Z2? ❷
No
Q7 or R10 is faulty.
Yes
Route Q7 to J2-21 to Q18 of Z4 is faulty.
Yes
AC Voltage
DC Voltage
Is Rear panel fuse normal?
No
Replace the fuse.
Yes
Is Rear panel AC/DC switch (S2) correct?
No
Set the Switch correctly.
Yes
Is 30 to 38 Vac applied between 1-5 of J1 in Z2 ❶ ?
No
Receiver overall circuit route J3 and J4 to J2 is faulty.
Yes
Is voltage applied between 1-5 of J1 in Z2 ❶ ?
No
J3 and J4 to J2 route in the transmitter overall circuit is faulty.
Yes
J1 to R10, Q7 is faulty.

Fig. 3-2 Power ON Lamp Troubleshooting Flowchart

3.2.2 Regulated DC Power Supply Troubleshooting

Refer to $\boxed{4}$: Power Supply Circuit (Z2): 43W30644 (1/5)

NOTE

When the +5 V or +12 V power supply is faulty, the following checks must be made step by step within 1 second. That is, after the power is turned on and checks are made for approximately 1 second, immediately turn the power off. For the next step, wait 5 to 6 seconds before turning the power on again, then perform the checks for 1 second and turn the power off. If this is not done, R14 may burn out.

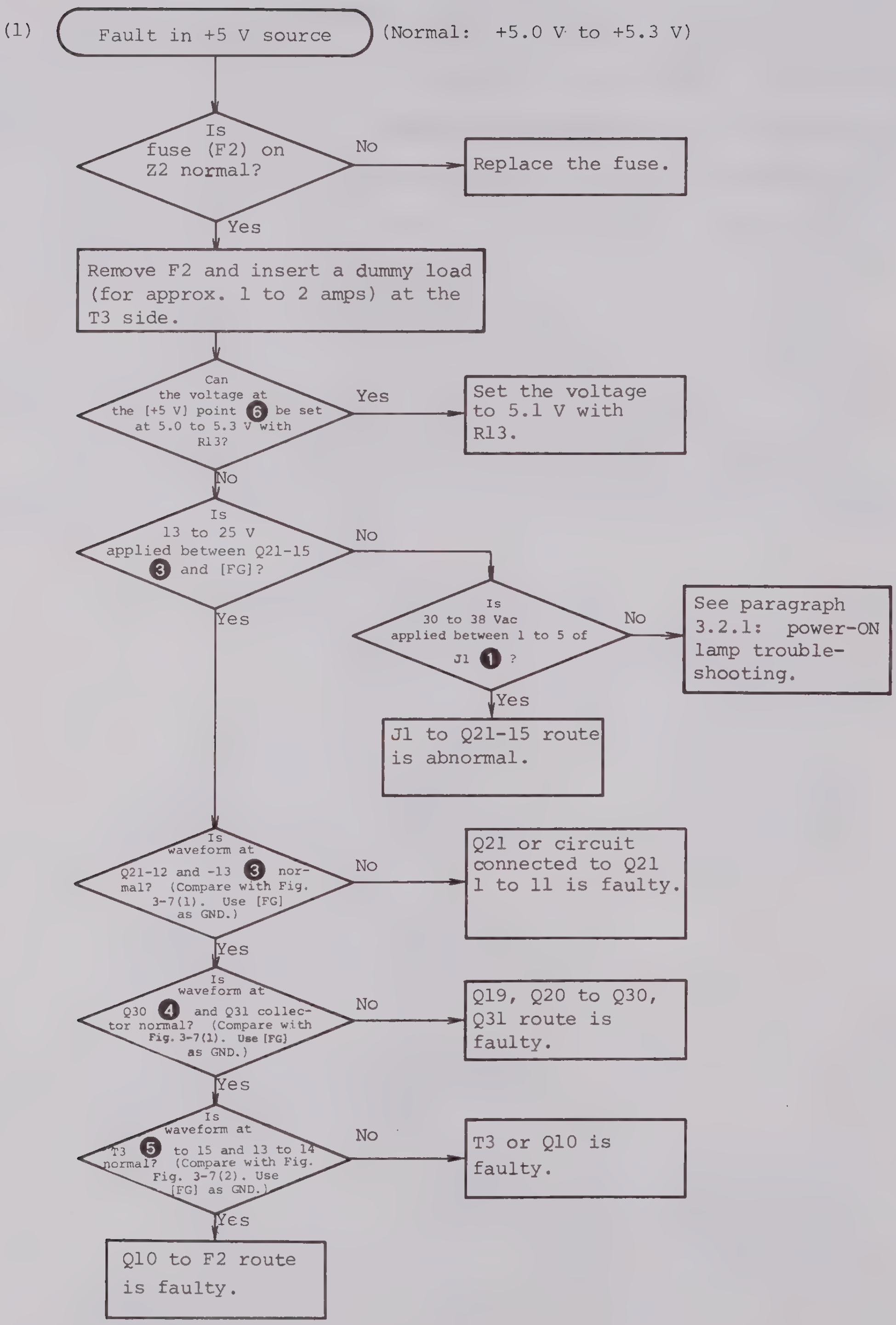

(1)
Fault in +5 V source
(Normal: +5.0 V to +5.3 V)
Is fuse (F2) on Z2 normal?
No
Replace the fuse.
Yes
Remove F2 and insert a dummy load (for approx. 1 to 2 amps) at the T3 side.
Can the voltage at the [+5 V] point ⑥ be set at 5.0 to 5.3 V with R13?
Yes
Set the voltage to 5.1 V with R13.
No
Is 13 to 25 V applied between Q21-15 ③ and [FG]?
No
Is 30 to 38 Vac applied between 1 to 5 of J1 ① ?
No
See paragraph 3.2.1: power-ON lamp trouble-shooting.
Yes
J1 to Q21-15 route is abnormal.
Yes
Is waveform at Q21-12 and -13 ③ normal? (Compare with Fig. 3-7(1). Use [FG] as GND.)
No
Q21 or circuit connected to Q21 1 to 11 is faulty.
Yes
Is waveform at Q30 ④ and Q31 collector normal? (Compare with Fig. 3-7(1). Use [FG] as GND.)
No
Q19, Q20 to Q30, Q31 route is faulty.
Yes
Is waveform at T3 ⑤ to 15 and 13 to 14 normal? (Compare with Fig. Fig. 3-7(2). Use [FG] as GND.)
No
T3 or Q10 is faulty.
Yes
Q10 to F2 route is faulty.

Fig. 3-3 Regulated DC Power Supply Troubleshooting Flowchart (+5 V)

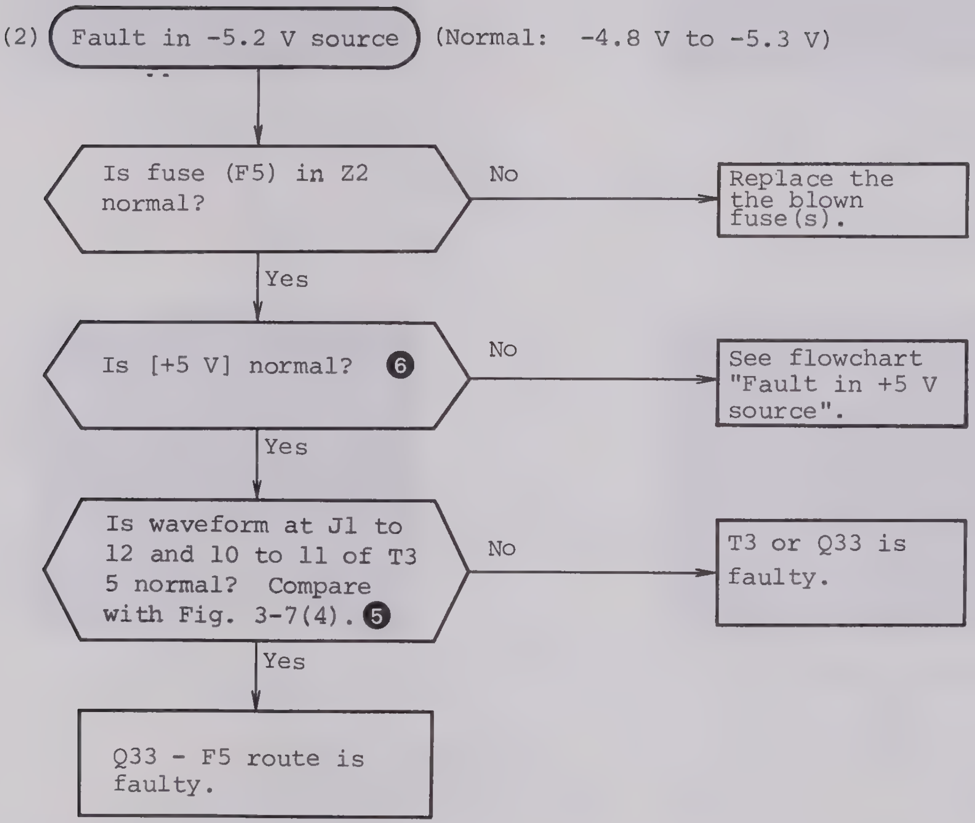

(2)
Fault in -5.2 V source
(Normal: -4.8 V to -5.3 V)
Is fuse (F5) in Z2 normal?
No
Replace the the blown fuse(s).
Yes
Is [+5 V] normal? ❻
No
See flowchart "Fault in +5 V source".
Yes
Is waveform at J1 to 12 and 10 to 11 of T3 5 normal? Compare with Fig. 3-7(4). ❺
No
T3 or Q33 is faulty.
Yes
Q33 - F5 route is faulty.

Fig. 3-4 Regulated DC Power Supply Troubleshooting Flowchart (-5.2 V)

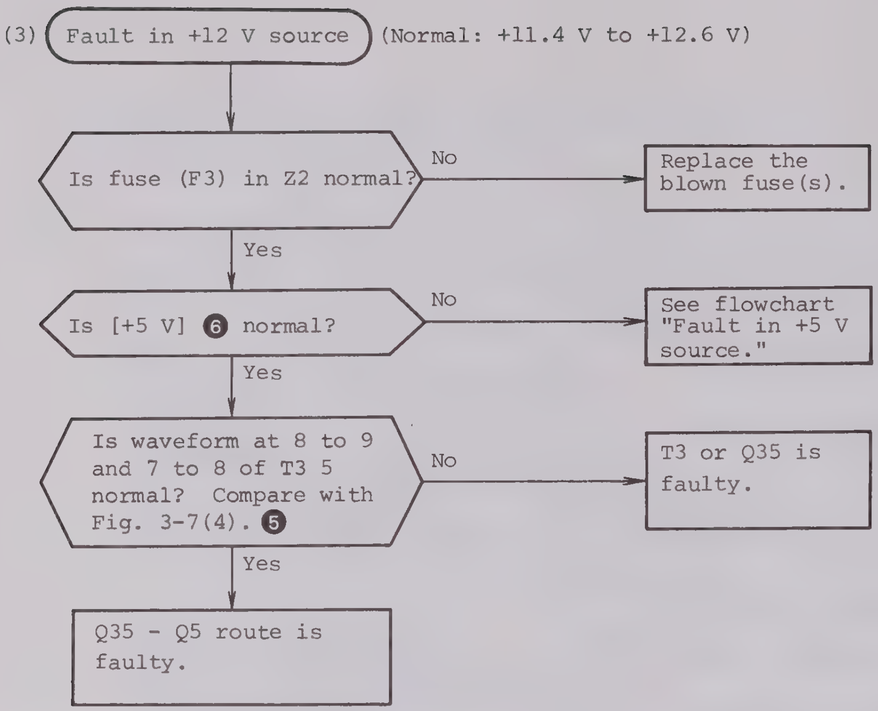

(3)
Fault in +12 V source
(Normal: +11.4 V to +12.6 V)
Is fuse (F3) in Z2 normal?
No
Replace the blown fuse(s).
Yes
Is [+5 V] ⑥ normal?
No
See flowchart "Fault in +5 V source."
Yes
Is waveform at 8 to 9 and 7 to 8 of T3 5 normal? Compare with Fig. 3-7(4). ⑤
No
T3 or Q35 is faulty.
Yes
Q35 - Q5 route is faulty.

Fig. 3-5 Regulated DC Power Supply Troubleshooting Flowchart (+12V)

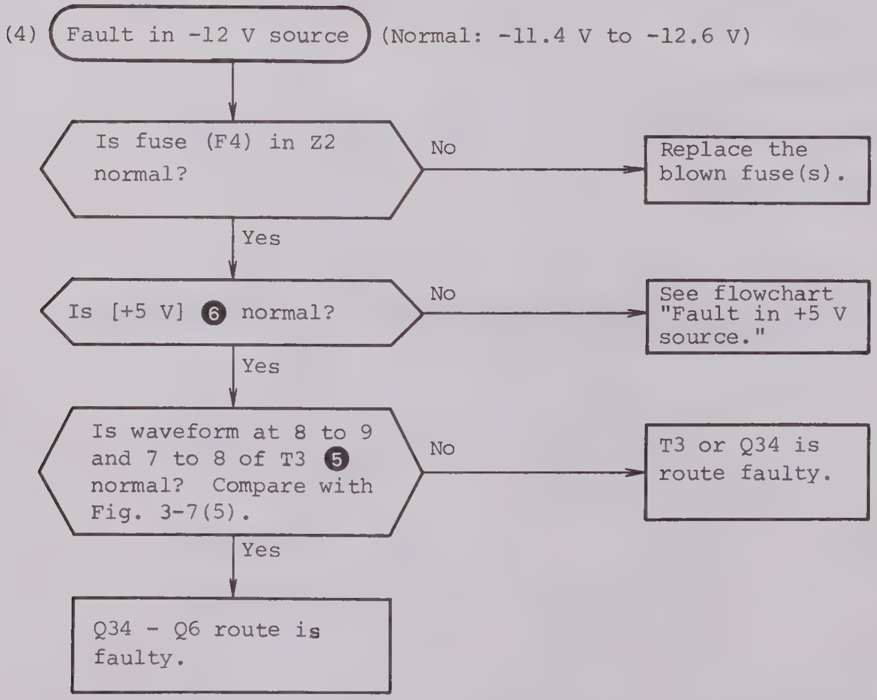
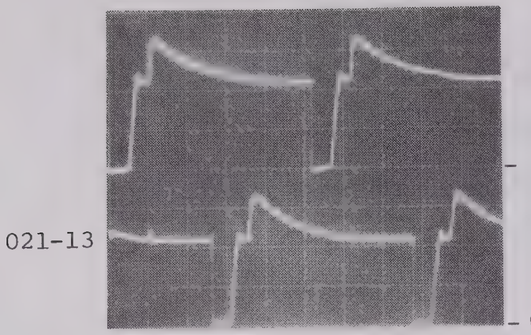
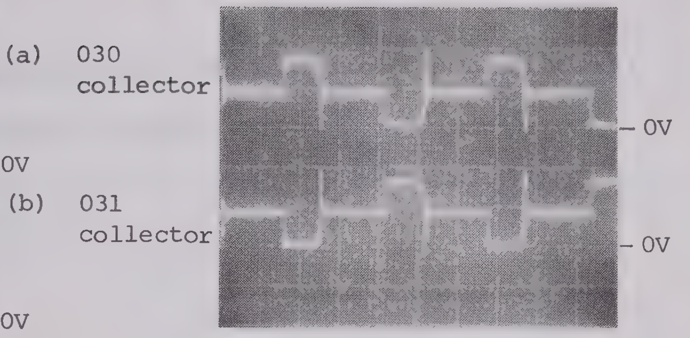

(4)
Fault in -12 V source
(Normal: -11.4 V to -12.6 V)
Is fuse (F4) in Z2 normal?
No
Replace the blown fuse(s).
Yes
Is [+5 V] ⑥ normal?
No
See flowchart "Fault in +5 V source."
Yes
Is waveform at 8 to 9 and 7 to 8 of T3 ⑤ normal? Compare with Fig. 3-7(5).
No
T3 or Q34 is route faulty.
Yes
Q34 - Q6 route is faulty.

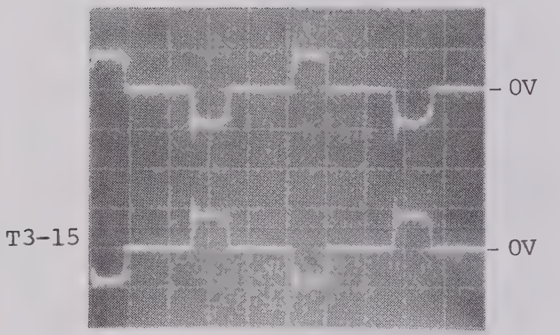
Fig. 3-6 Regulated DC Power Supply Troubleshooting Flowchart (-12 V)



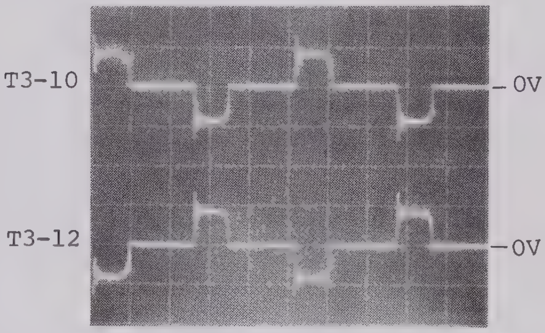
(1) 10 V/div, 5 μs/div



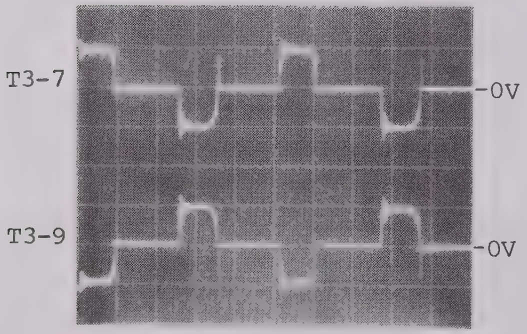
(2) 50 V/div, 5 μs/div



(3) 20 V/div, 5 μs/div



(4) 20 V/div, 5 μs/div



(5) 50 V/div, 5 μs/div

Fig. 3-7 Waveforms of Power Supply Circuit Main Parts

3.2.3 Front Panel LED or Key Switch Troubleshooting

Refer to
- [4] Power Supply Circuit (Z2): 43W30644 (3/5, 5/5)
- [6] Front Panel Circuit (Z4): 43W30646 (1/3 to 3/3)

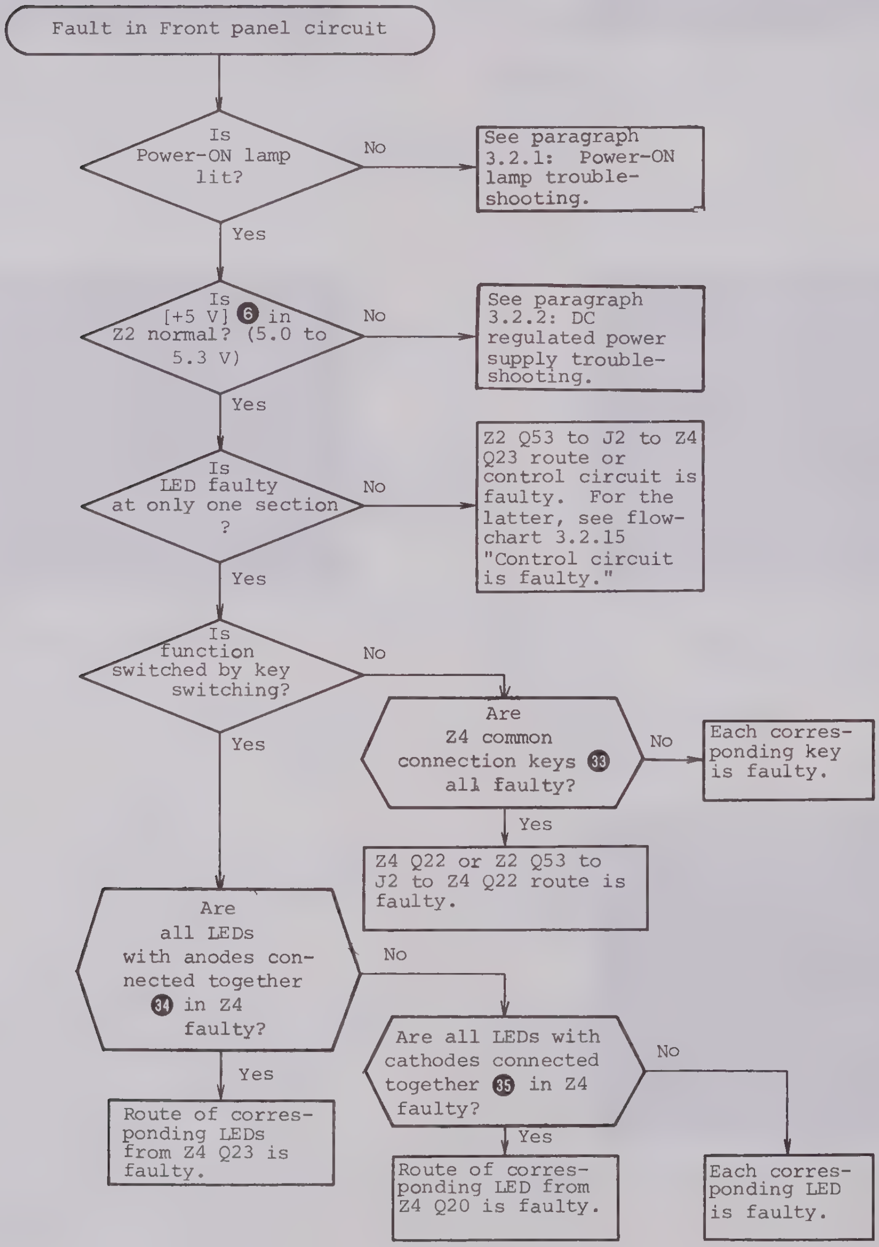

Fault in Front panel circuit
Is Power-ON lamp lit?
No
See paragraph 3.2.1: Power-ON lamp trouble-shooting.
Yes
Is [+5 V] ⑥ in Z2 normal? (5.0 to 5.3 V)
No
See paragraph 3.2.2: DC regulated power supply trouble-shooting.
Yes
Is LED faulty at only one section ?
No
Z2 Q53 to J2 to Z4 Q23 route or control circuit is faulty. For the latter, see flow-chart 3.2.15 "Control circuit is faulty."
Yes
Is function switched by key switching?
No
Are Z4 common connection keys ㉝ all faulty?
No
Each corres-ponding key is faulty.
Yes
Z4 Q22 or Z2 Q53 to J2 to Z4 Q22 route is faulty.
Yes
Are all LEDs with anodes con-nected together ㉞ in Z4 faulty?
No
Yes
Route of corres-ponding LEDs from Z4 Q23 is faulty.
Are all LEDs with cathodes connected together ㉟ in Z4 faulty?
No
Yes
Route of corres-ponding LED from Z4 Q20 is faulty.
Each corres-ponding LED is faulty.

Fig. 3-8 Front Panel LED or Key Switch Troubleshooting Flowchart

3.2.4 External Clock Operation Troubleshooting

Refer to
- 4 Power Supply Circuit (Z2): 43W30644 (4/5, 5/5)
- 5 Pattern Generator (Z3): 43W30645 (1/15, 14/15)
- 6 OPT 01 to 04 (Z5): 43W32137 (1/1)

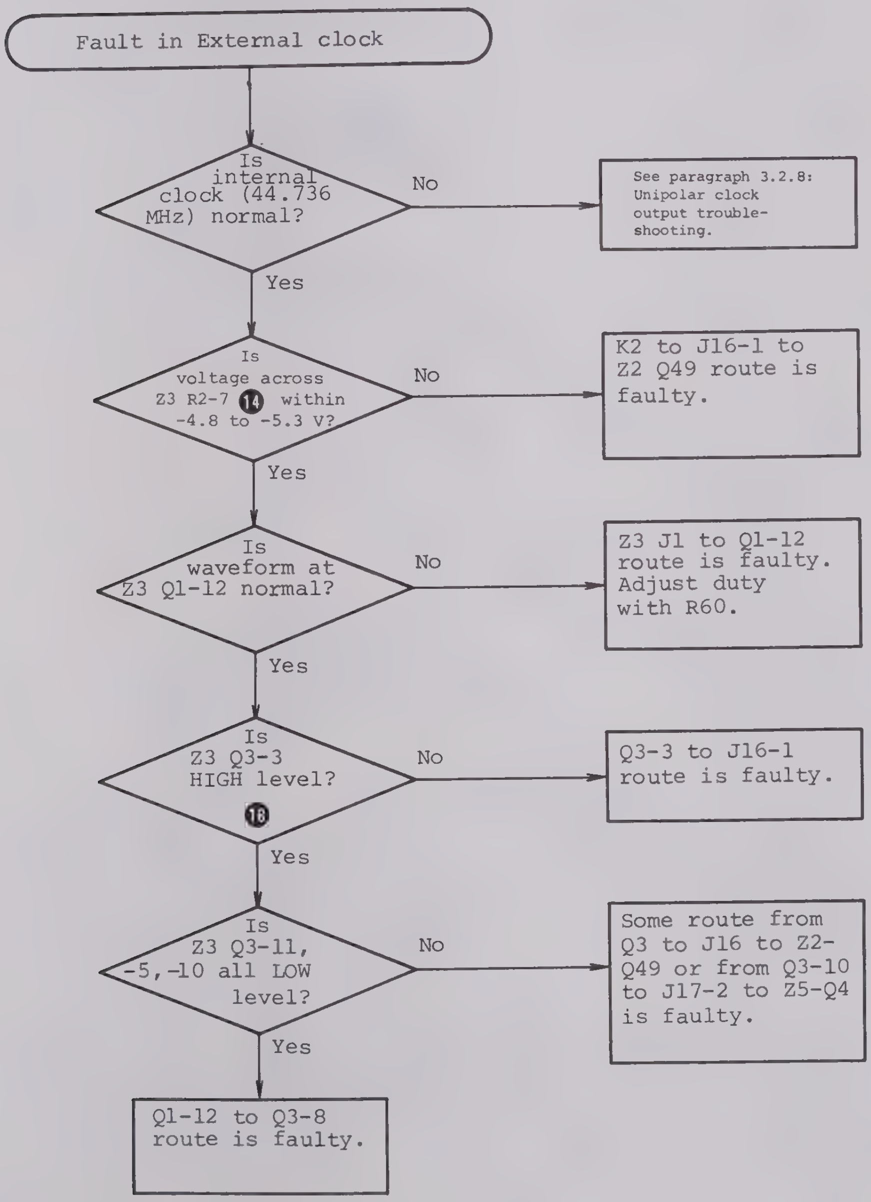

Fault in External clock
Is internal clock (44.736 MHz) normal?
No
See paragraph 3.2.8: Unipolar clock output troubleshooting.
Yes
Is voltage across Z3 R2-7 ⑭ within -4.8 to -5.3 V?
No
K2 to J16-1 to Z2 Q49 route is faulty.
Yes
Is waveform at Z3 Q1-12 normal?
No
Z3 J1 to Q1-12 route is faulty. Adjust duty with R60.
Yes
Is Z3 Q3-3 HIGH level? ⑱
No
Q3-3 to J16-1 route is faulty.
Yes
Is Z3 Q3-11, -5,-10 all LOW level?
No
Some route from Q3 to J16 to Z2-Q49 or from Q3-10 to J17-2 to Z5-Q4 is faulty.
Yes
Q1-12 to Q3-8 route is faulty.

Fig. 3-9 External Clock Operation Troubleshooting Flowchart

3.2.5 F1 to F5 Operation Troubleshooting

Refer to
4 Power Supply Circuit (Z9): 43W30644 (4/5, 5/5)
5 Pattern Generator (Z3): 43W30645 (1/15, 14/15)
7 OPT 01 to 04 (Z5): 43W32137 (1/1)

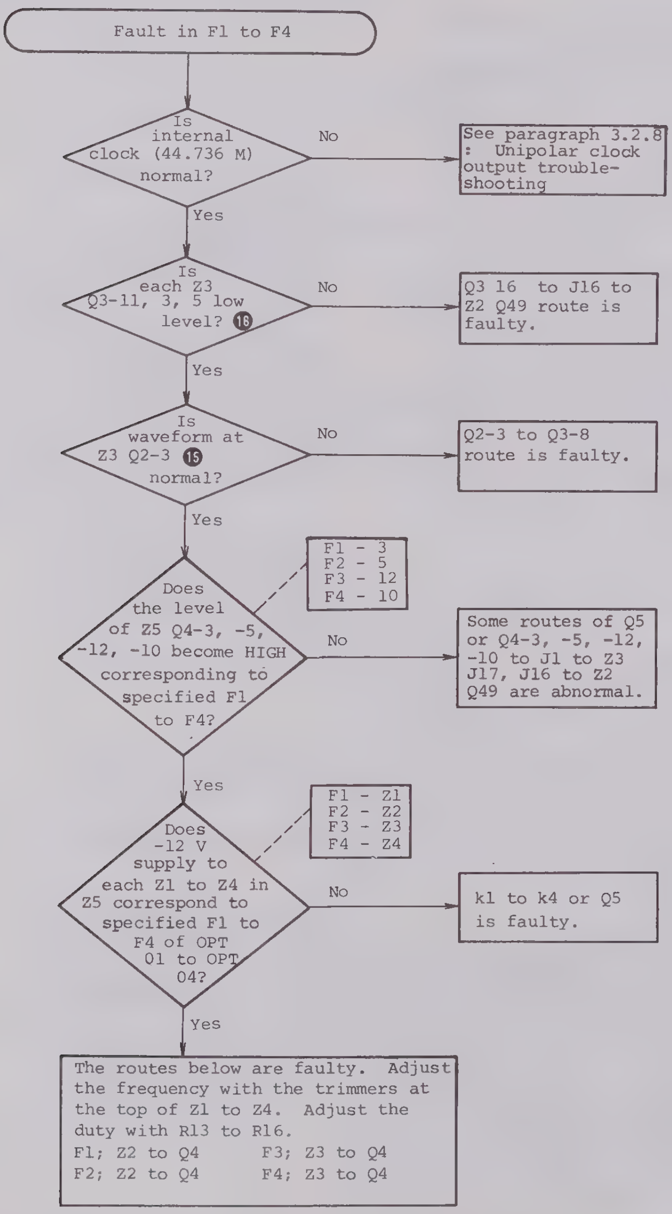

Fault in F1 to F4
Is internal clock (44.736 M) normal?
No
See paragraph 3.2.8 : Unipolar clock output trouble-shooting
Yes
Is each Z3 Q3-11, 3, 5 low level? ⑯
No
Q3 16 to J16 to Z2 Q49 route is faulty.
Yes
Is waveform at Z3 Q2-3 ⑮ normal?
No
Q2-3 to Q3-8 route is faulty.
Yes
F1 - 3
F2 - 5
F3 - 12
F4 - 10
Does the level of Z5 Q4-3, -5, -12, -10 become HIGH corresponding to specified F1 to F4?
No
Some routes of Q5 or Q4-3, -5, -12, -10 to J1 to Z3 J17, J16 to Z2 Q49 are abnormal.
Yes
F1 - Z1
F2 - Z2
F3 - Z3
F4 - Z4
Does -12 V supply to each Z1 to Z4 in Z5 correspond to specified F1 to F4 of OPT 01 to OPT 04?
No
k1 to k4 or Q5 is faulty.
Yes
The routes below are faulty. Adjust the frequency with the trimmers at the top of Z1 to Z4. Adjust the duty with R13 to R16.
F1; Z2 to Q4
F2; Z2 to Q4
F3; Z3 to Q4
F4; Z3 to Q4

Fig. 3-10 F1 to F5 Operation Troubleshooting Flowchart

3.2.6 Jitter Modulation Troubleshooting

Refer to
4 Power Supply Circuit (Z2): 43W30644 (4/5, 5/5)
5 Pattern Generator (Z3): 43W30645 (13/15, 14/15)
6 Front Panel Circuit (Z4): 43W30646 (3/3)

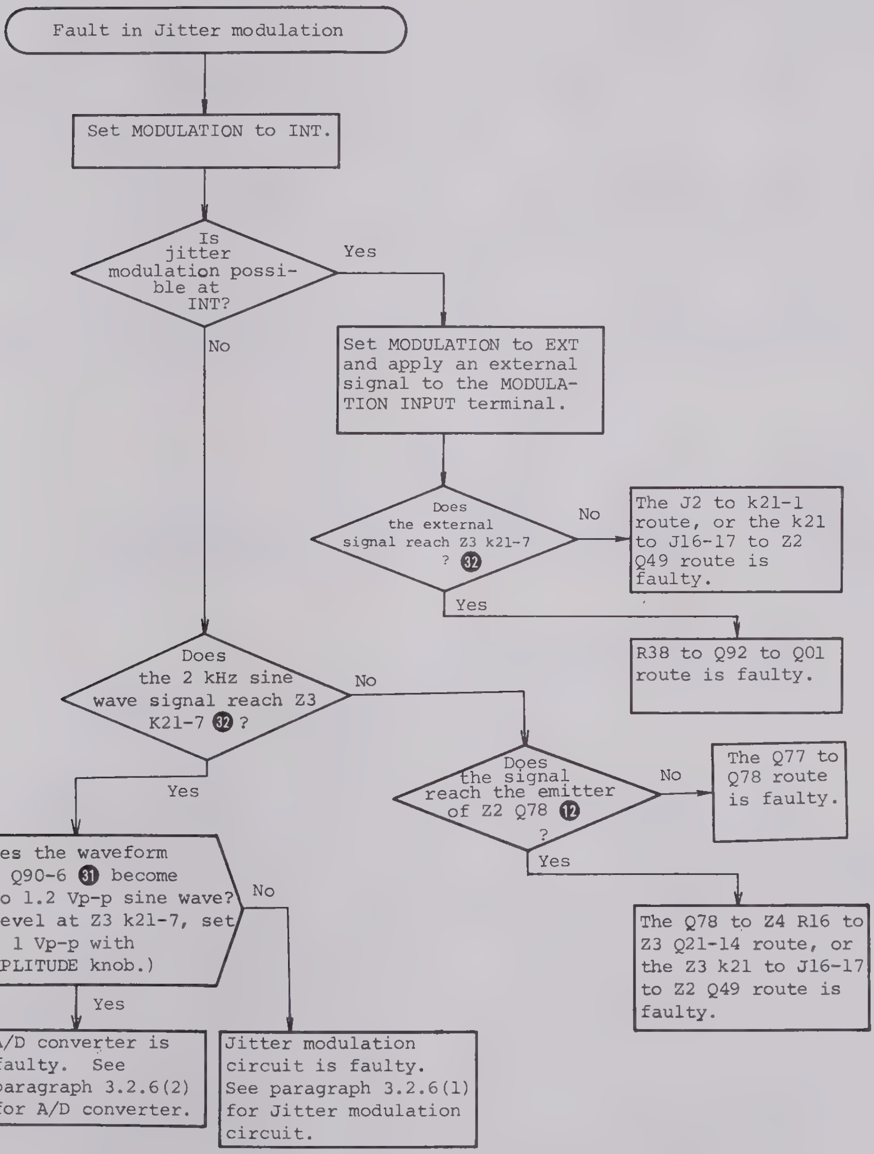

Fault in Jitter modulation
Set MODULATION to INT.
Is jitter modulation possible at INT?
Yes
No
Set MODULATION to EXT and apply an external signal to the MODULATION INPUT terminal.
Does the external signal reach Z3 k21-7 ? ㉜
No
The J2 to k21-1 route, or the k21 to J16-17 to Z2 Q49 route is faulty.
Yes
R38 to Q92 to Q01 route is faulty.
Does the 2 kHz sine wave signal reach Z3 K21-7 ㉜ ?
No
Does the signal reach the emitter of Z2 Q78 ⑫ ?
No
The Q77 to Q78 route is faulty.
Yes
The Q78 to Z4 R16 to Z3 Q21-14 route, or the Z3 k21 to J16-17 to Z2 Q49 route is faulty.
Yes
Does the waveform at Q90-6 ㉛ become a 0.8 to 1.2 Vp-p sine wave? (When level at Z3 k21-7, set to 1 Vp-p with AMPLITUDE knob.)
No
Yes
A/D converter is faulty. See paragraph 3.2.6(2) for A/D converter.
Jitter modulation circuit is faulty. See paragraph 3.2.6(1) for Jitter modulation circuit.

Fig. 3-11 Jitter Modulation Troubleshooting Flowchart

(1) Jitter Modulation Circuit

The main section of the jitter modulation circuit is shown in Fig. 3-12.

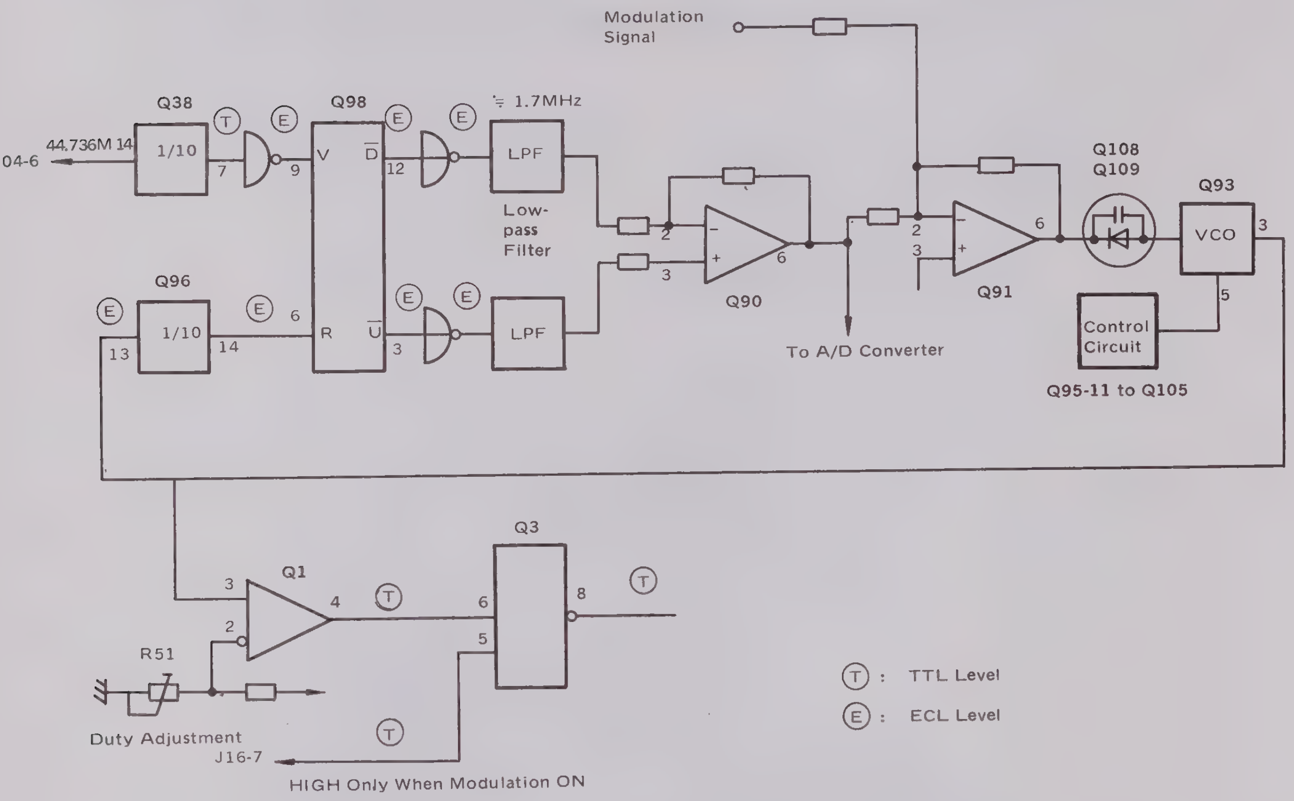

Modulation Signal
Q38
Q98
≒ 1.7MHz
04-6
44.736M 14
1/10
7
9
V
D̄
12
LPF
Low-pass Filter
Q96
1/10
13
14
6
R
Ū
3
LPF
2
3
6
Q90
To A/D Converter
2
3
6
Q91
Q108
Q109
Q93
VCO
3
5
Control Circuit
Q95-11 to Q105
T
E
Q1
3
2
4
Q3
6
5
8
R51
Duty Adjustment
J16-7
HIGH Only When Modulation ON
T : TTL Level
E : ECL Level

Fig. 3-12 Jitter Modulation Circuit

Jitter modulation is performed as follows.

The voltage applied to Q108 and Q109 is changed by the internal or external modulation signal. Q108 and Q109 are voltage variable capacitance diodes. Their capacitance is changed by this voltage change. As a result, the frequency of the VCO changes, and jitter modulation is applied. The Q38, Q96 to Q90 route is the circuit for locking the BCO center frequency at 44.736 MHz. When the modulation signal is not applied, the VCO output is locked at 44.736 MHz through the following processes.

VCO frequency becomes higher than 44.736 MHz. → Mark rate of Q98 $\bar{D}$ becomes lower than the $\bar{V}$ output. → Q90 output level becomes large. → Q91 output level becomes small. → Voltage applied to Q108 and Q109 becomes small. → VCO frequency becomes lower.

Therefore, when the jitter modulation circuit is abnormal, check if each circuit is operating in accordance with the above-mentioned flow. If a point which does not conform to this flow is found, that part is faulty.

The control circuit is for stopping the oscillation of the VCO when MODULATION is OFF. The Q93-5 L level is -4.8 V or less when MODULATION is OFF, and -4 V or more when MODULATION is ON. R51 is used to adjust the duty of the jittered clock.

(2) A/D Converter

The main section of the A/D converter is shown in Fig. 3-13.

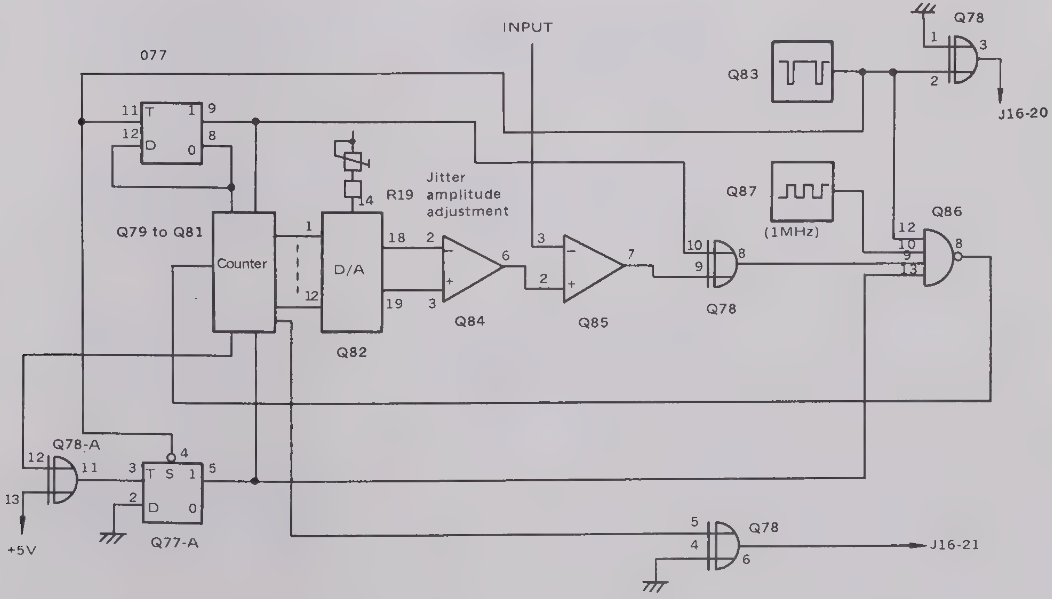

INPUT
Q78
Q77
Q83
J16-20
Q87
(1MHz)
Q86
R19
Jitter amplitude adjustment
Q79 to Q81
Counter
D/A
Q82
Q84
Q85
Q78
Q78-A
+5V
Q77-A
Q78
J16-21

Fig. 3-13 A/D Converter

A gate pulse is generated at Q83. It lasts approximately 700 ms. The input signal is compared to the D/A output by Q85. If there is a difference between the two signals, the pulse of Q87 is applied to the counter circuit (Q79 to Q81). If the level of the input signal and D/A output is the same, the pulse from Q87 is inhibited by Q86.

The number of pulses from the start of measurement until both levels match is counted by CLK2 of Q57 in Z2 (power supply circuit) through J16-21. The output of Q78-3 is used as the interrupt signal at the end of measurement in Z2. Q78-A and Q77-A form the circuit for stopping counting by the counter when the counter overflows. A/D circuit gain adjustment, that is, jitter amplitude adjustment, is performed with R19.

3.2.7 DS-3 Output Waveform Troubleshooting

Refer to
- 4 Power Supply Circuit (Z2): 43W30644 (4/5, 5/5)
- 5 Pattern Generator (Z3): 43W30645 (2/15, 5/15, 6/15, 5/15 to 12/15)

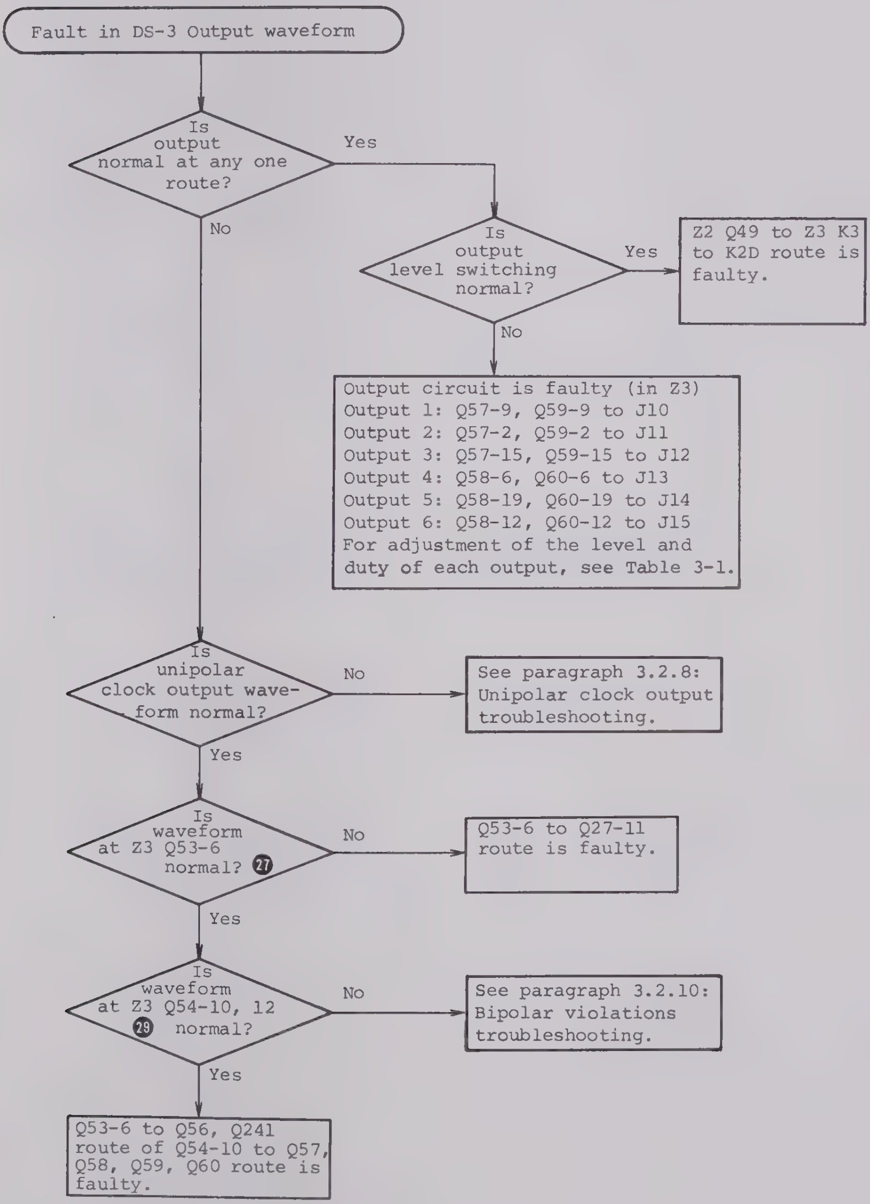

Fault in DS-3 Output waveform
Is output normal at any one route?
Yes
No
Is output level switching normal?
Yes
Z2 Q49 to Z3 K3 to K2D route is faulty.
No
Output circuit is faulty (in Z3)
Output 1: Q57-9, Q59-9 to J10
Output 2: Q57-2, Q59-2 to J11
Output 3: Q57-15, Q59-15 to J12
Output 4: Q58-6, Q60-6 to J13
Output 5: Q58-19, Q60-19 to J14
Output 6: Q58-12, Q60-12 to J15
For adjustment of the level and duty of each output, see Table 3-1.
Is unipolar clock output waveform normal?
No
See paragraph 3.2.8: Unipolar clock output troubleshooting.
Yes
Is waveform at Z3 Q53-6 normal? ㉗
No
Q53-6 to Q27-11 route is faulty.
Yes
Is waveform at Z3 Q54-10, 12 ㉙ normal?
No
See paragraph 3.2.10: Bipolar violations troubleshooting.
Yes
Q53-6 to Q56, Q241 route of Q54-10 to Q57, Q58, Q59, Q60 route is faulty.

Fig. 3-14 DS-3 Output Waveform Troubleshooting Flowchart

Table 3-1 DS-3 Output Level and Duty Adjustment

Output	Level		Duty	
	+ pulse	- pulse	+ pulse	- pulse
1	R130	R129	R69	R445
2	R128	R127	R69	R445
3	R126	R125	R69	R445
4	R124	R123	R442	R448
5	R122	R121	R442	R448
6	R120	R119	R442	R448

3.2.8 Unipolar Clock Output (Frequency, Waveform) Troubleshooting

Refer to
- 4 Power Supply Circuit (Z2): 43W30644 (4/5, 5/5)
- 5 Refer to Pattern Generator (Z3): 43W30645 (2/15, 3/15, 7/15, 8/15, 14/15)
- 6 OPT 01 to 04 (Z5): 43W32137 (1/1)

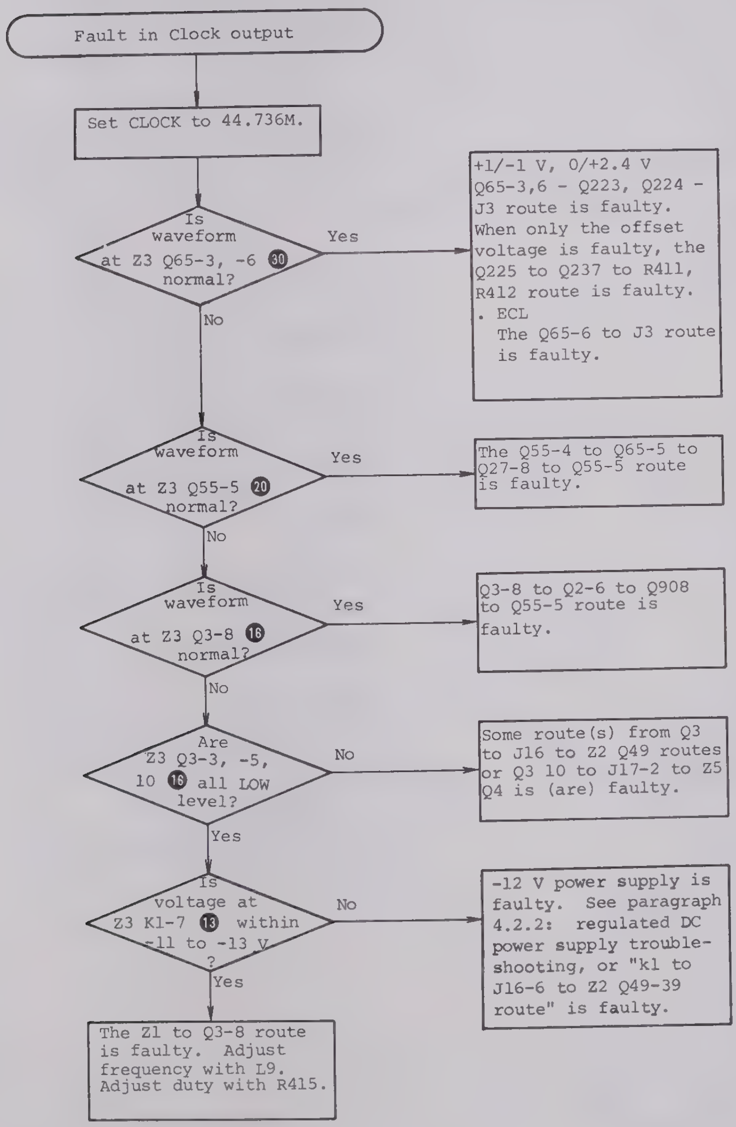

Fault in Clock output
Set CLOCK to 44.736M.
Is waveform at Z3 Q65-3, -6 ㉚ normal?
Yes
+1/-1 V, 0/+2.4 V Q65-3,6 - Q223, Q224 - J3 route is faulty. When only the offset voltage is faulty, the Q225 to Q237 to R411, R412 route is faulty.
. ECL The Q65-6 to J3 route is faulty.
No
Is waveform at Z3 Q55-5 ⑳ normal?
Yes
The Q55-4 to Q65-5 to Q27-8 to Q55-5 route is faulty.
No
Is waveform at Z3 Q3-8 ⑯ normal?
Yes
Q3-8 to Q2-6 to Q908 to Q55-5 route is faulty.
No
Are Z3 Q3-3, -5, 10 ⑯ all LOW level?
No
Some route(s) from Q3 to J16 to Z2 Q49 routes or Q3 10 to J17-2 to Z5 Q4 is (are) faulty.
Yes
Is voltage at Z3 K1-7 ⑬ within -11 to -13 V ?
No
-12 V power supply is faulty. See paragraph 4.2.2: regulated DC power supply trouble-shooting, or "kl to J16-6 to Z2 Q49-39 route" is faulty.
Yes
The Z1 to Q3-8 route is faulty. Adjust frequency with L9. Adjust duty with R415.

Fig. 3-15 Unipolar Clock Output (Frequency, Waveform) Troubleshooting Flowchart

3.2.9 Unipolar Data Output Waveform Troubleshooting

Refer to 5 Pattern Generator (Z3): 43W30645 (3/15, 4/15, 7/15, 8/15)

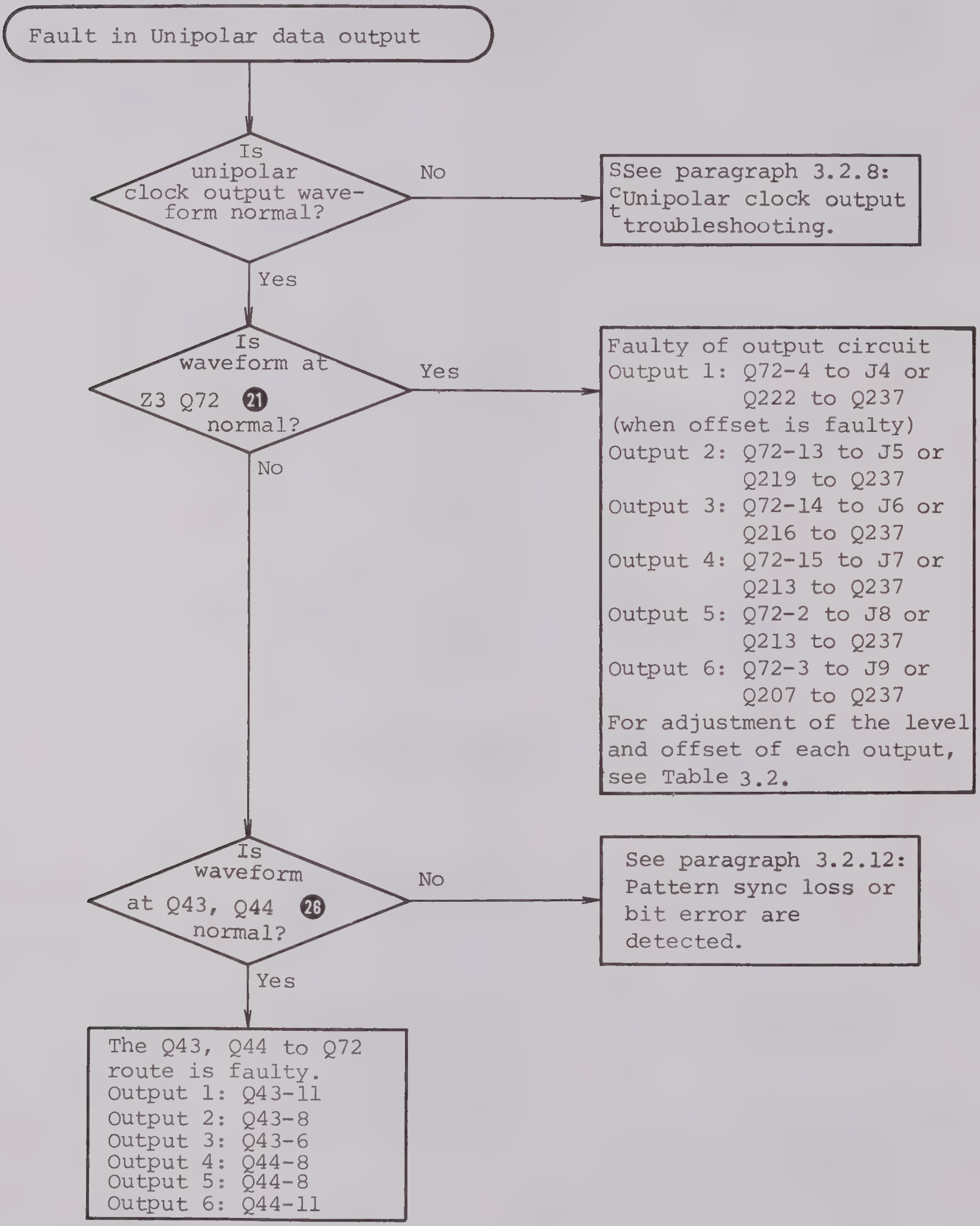

Fault in Unipolar data output
Is unipolar clock output waveform normal?
No
See paragraph 3.2.8: Unipolar clock output troubleshooting.
Yes
Is waveform at Z3 Q72 ㉑ normal?
Yes
Faulty of output circuit
Output 1: Q72-4 to J4 or Q222 to Q237
(when offset is faulty)
Output 2: Q72-13 to J5 or Q219 to Q237
Output 3: Q72-14 to J6 or Q216 to Q237
Output 4: Q72-15 to J7 or Q213 to Q237
Output 5: Q72-2 to J8 or Q213 to Q237
Output 6: Q72-3 to J9 or Q207 to Q237
For adjustment of the level and offset of each output, see Table 3.2.
No
Is waveform at Q43, Q44 ㉖ normal?
No
See paragraph 3.2.12: Pattern sync loss or bit error are detected.
Yes
The Q43, Q44 to Q72 route is faulty.
Output 1: Q43-11
Output 2: Q43-8
Output 3: Q43-6
Output 4: Q44-8
Output 5: Q44-8
Output 6: Q44-11

Fig. 3-16 Unipolar Data Output Waveform Troubleshooting Flowchart

Table 3-2 Unipolar Data Output Level and Offset Adjustment

Output	Level		Offset	
	+1/-1 V	0/+2.4 V	+1/-1 V	0/+2.4 V
1	R280		R411	R412
2	R278			
3	R276			
4	R274			
5	R272			
6	R270			

3.2.10 BSZ3 Converter Troubleshooting

Refer to [5] Pattern Generator (Z3) 43W30645 (2/15, 5/15)

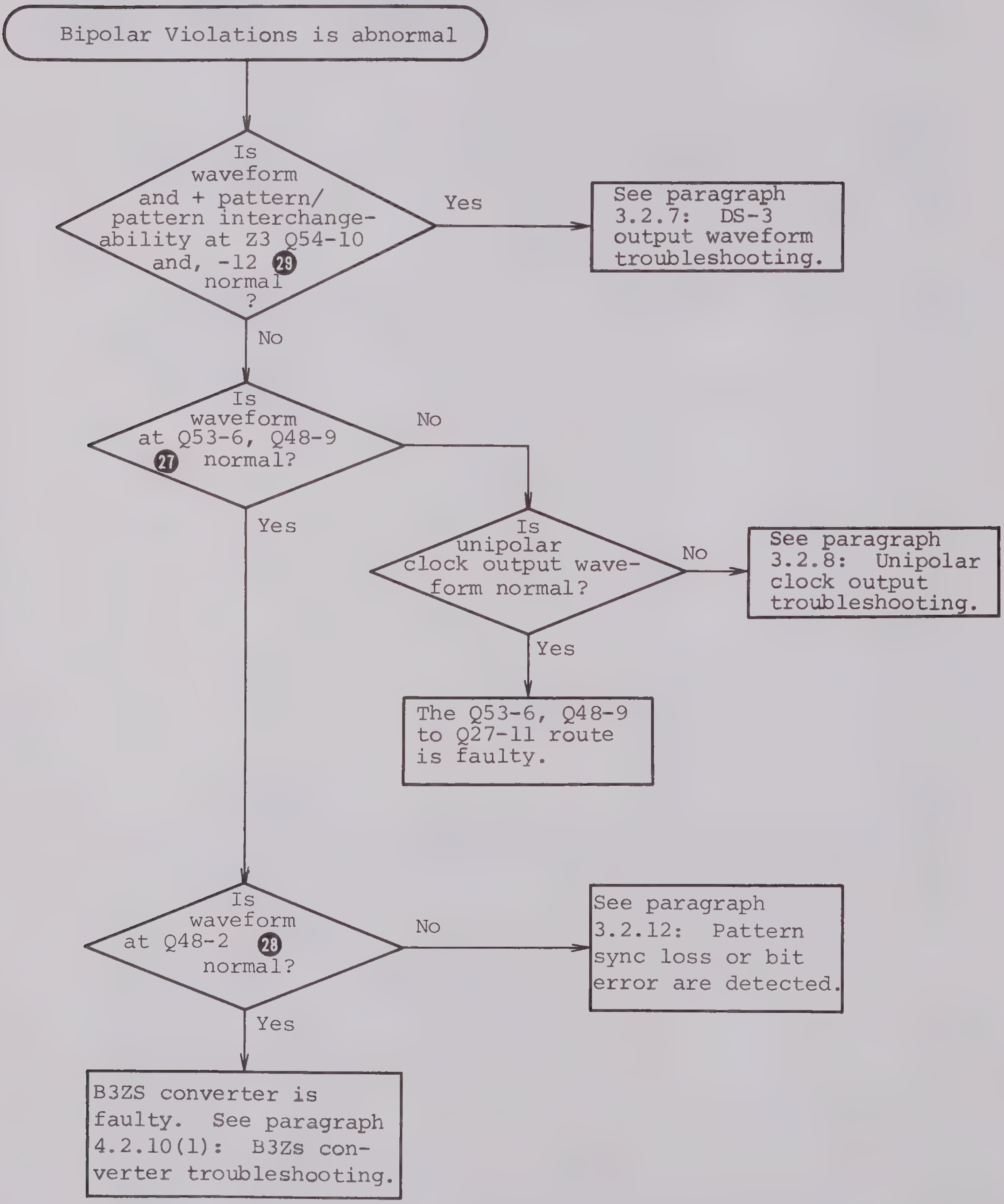

Bipolar Violations is abnormal
Is waveform and + pattern/ pattern interchangeability at Z3 Q54-10 and, -12 ㉙ normal ?
Yes
See paragraph 3.2.7: DS-3 output waveform troubleshooting.
No
Is waveform at Q53-6, Q48-9 ㉗ normal?
No
Is unipolar clock output waveform normal?
No
See paragraph 3.2.8: Unipolar clock output troubleshooting.
Yes
The Q53-6, Q48-9 to Q27-11 route is faulty.
Yes
Is waveform at Q48-2 ㉘ normal?
No
See paragraph 3.2.12: Pattern sync loss or bit error are detected.
Yes
B3ZS converter is faulty. See paragraph 4.2.10(1): B3Zs converter troubleshooting.

Fig. 3-17 BSZ3 Converter Troubleshooting Flowchart

The B3ZS conversion rules are shown below. (CCITT Rec. G.703)

The B3ZS bipolar converter with three-zero substitution codes is a modified bipolar pulse format. Logical 1 bits are 50 per cent duty cycle and are generally alternately positive and negative with respect to the logical 0 level. Exceptions are cases where three logical 0s appear together in the bit-stream. In the B3ZS format, each block of three consecutive zeros is removed and replaced by BOV or OOV, where B represents a pulse conforming with the bipolar rule and V represents a pulse violating the bipolar rule. The choice of BOV or OOV is made so that there is an odd number of B pulses between consecutive V pulses.

The main section of the B3ZS converter (except the clock) is shown in Fig. 3-18.

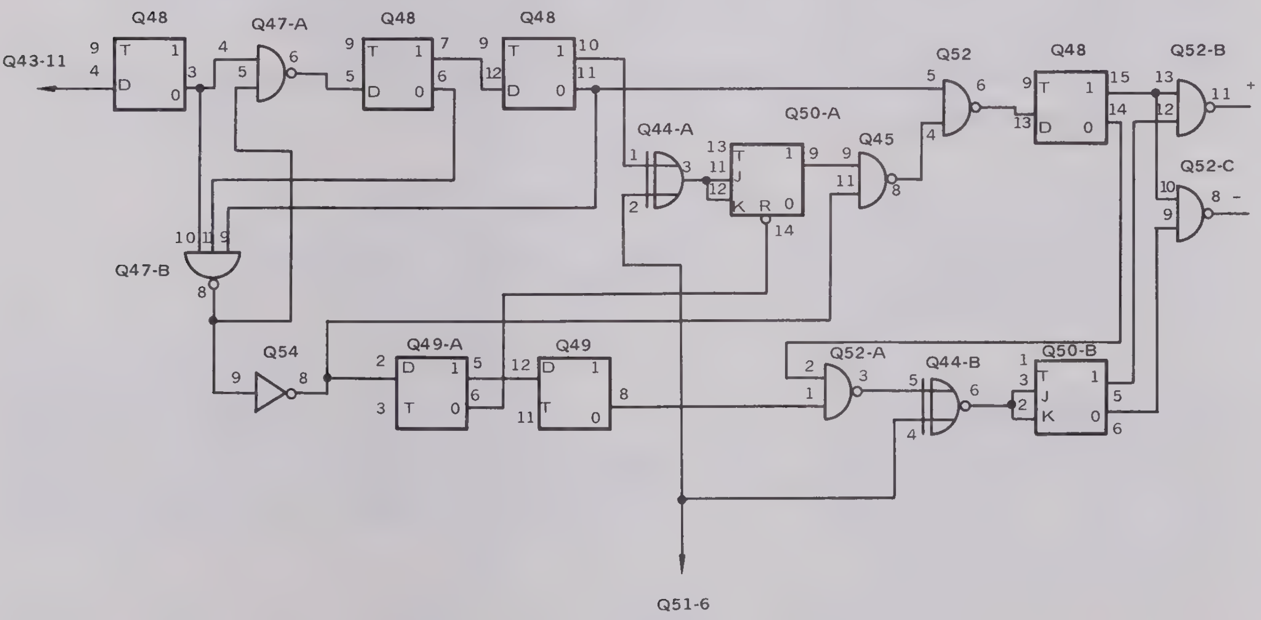

Q43-11
Q48
Q47-A
Q48
Q48
Q52
Q48
Q52-B
Q50-A
Q44-A
Q45
Q52-C
Q47-B
Q54
Q49-A
Q49
Q52-A
Q44-B
Q50-B
Q51-6
+
-
T
D
J
K
R

Fig. 3-18 B3ZS Converter

In the figure above, Q44-A and Q44-B are the circuits for bipolar violation addition. Normally, Q44-2 and Q44-4 are LOW level. Q47-B is the circuit for detecting a three consecutive bit "0" pattern from Q47-A is the circuit for converting the third "0" of the three to "1" each time the previously described pattern is detected. This "1" becomes the V bit.

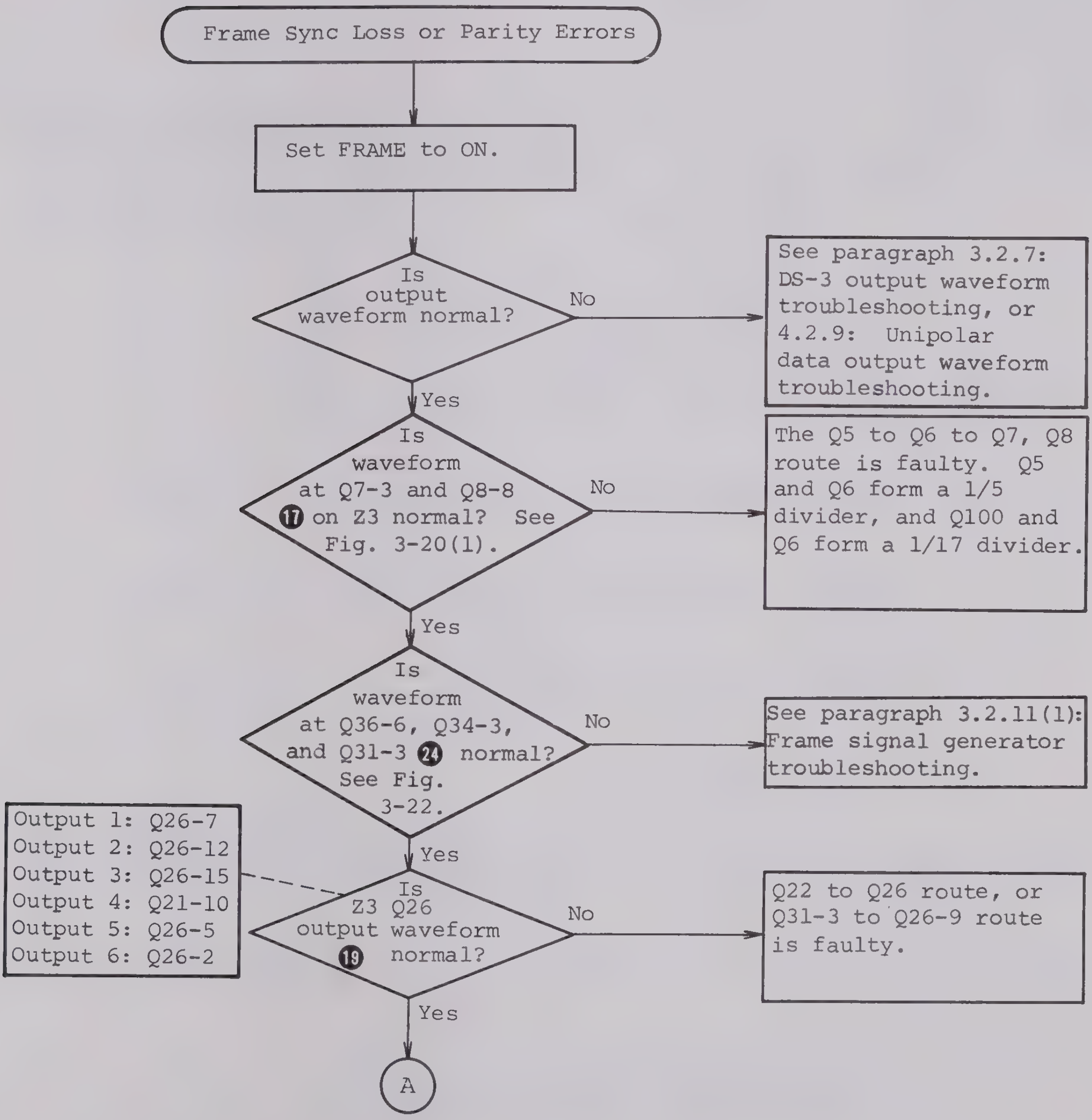
50-Z, Q45, and Q49-A are the circuits which judge whether a "B" bit is added or not.

The output of Q50-A is reset (by Q49-6) at each "V" bit and is inverted each time a "1" pattern is input. If the number of "1" patterns up to input of the next three consecutive "0" patterns is an even number, the Q50-A output level remains LOW. If it is an odd number, the Q50-A output level becomes HIGH. When the Q50-A output level is HIGH, a "B" bit is added. The Q49-A to Q50-A output route is the circuit for inhibiting the "V" bit from the pattern to generate a bipolar violation at the "V" bit.

The pattern is divided into a + pattern/- pattern by Q50-B, Q52-B, and Q52-C.

3.2.11 Frame Signal Generator Troubleshooting

Refer to 5 Pattern Generator (Z3) 43W30645 (2/15, 4/15)



Frame Sync Loss or Parity Errors
Set FRAME to ON.
Is output waveform normal?
No
See paragraph 3.2.7: DS-3 output waveform troubleshooting, or 4.2.9: Unipolar data output waveform troubleshooting.
Yes
Is waveform at Q7-3 and Q8-8 ⑰ on Z3 normal? See Fig. 3-20(1).
No
The Q5 to Q6 to Q7, Q8 route is faulty. Q5 and Q6 form a 1/5 divider, and Q100 and Q6 form a 1/17 divider.
Yes
Is waveform at Q36-6, Q34-3, and Q31-3 ㉔ normal? See Fig. 3-22.
No
See paragraph 3.2.11(1): Frame signal generator troubleshooting.
Yes
Output 1: Q26-7
Output 2: Q26-12
Output 3: Q26-15
Output 4: Q21-10
Output 5: Q26-5
Output 6: Q26-2
Is Z3 Q26 output waveform ⑲ normal?
No
Q22 to Q26 route, or Q31-3 to Q26-9 route is faulty.
Yes
A

Fig. 3-19 Frame Signal Generator Troubleshooting Flowchart

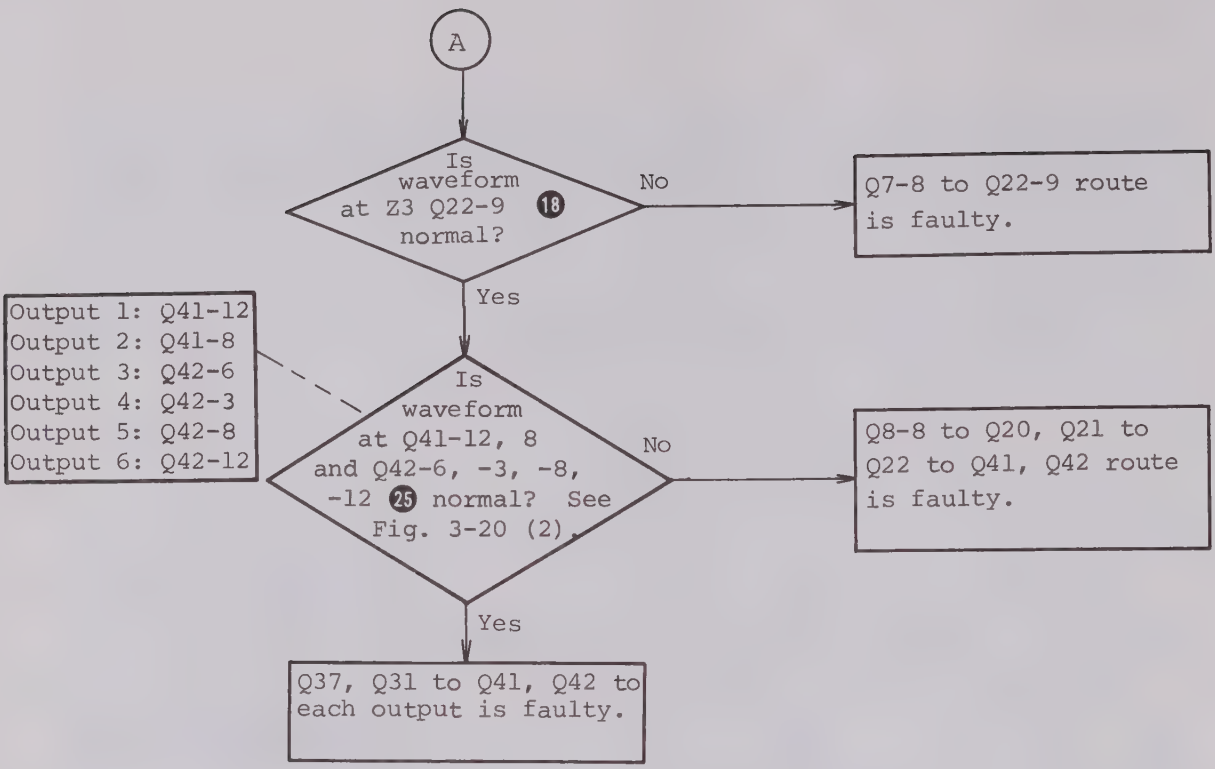
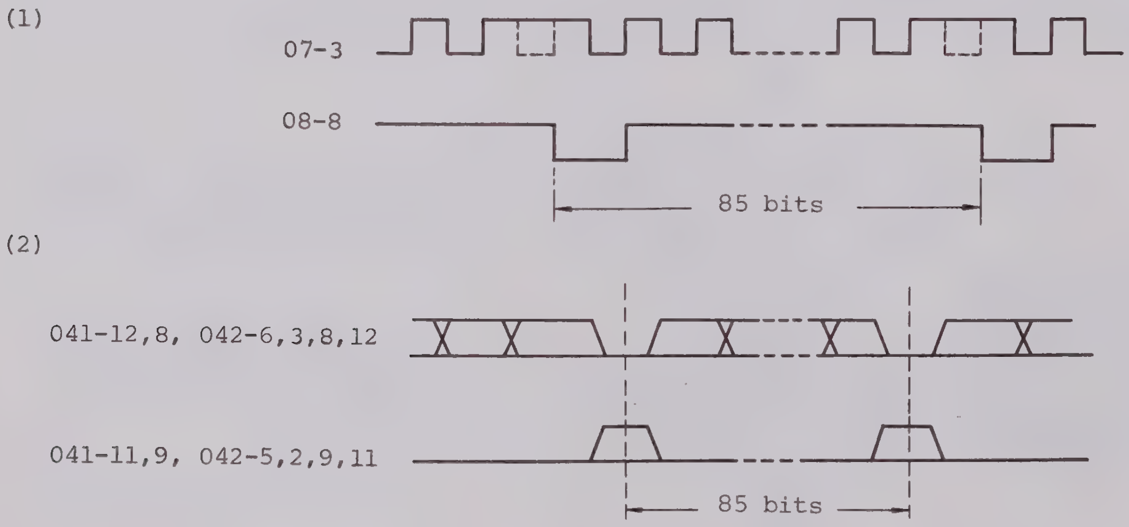

A
Is waveform at Z3 Q22-9 ⓲ normal?
No
Q7-8 to Q22-9 route is faulty.
Yes
Output 1: Q41-12
Output 2: Q41-8
Output 3: Q42-6
Output 4: Q42-3
Output 5: Q42-8
Output 6: Q42-12
Is waveform at Q41-12, 8 and Q42-6, -3, -8, -12 ㉕ normal? See Fig. 3-20 (2).
No
Q8-8 to Q20, Q21 to Q22 to Q41, Q42 route is faulty.
Yes
Q37, Q31 to Q41, Q42 to each output is faulty.

Fig. 3-19 (Cont.) Control Circuit Troubleshooting Flow Chart


(1)
07-3
08-8
85 bits
(2)
041-12,8, 042-6,3,8,12
041-11,9, 042-5,2,9,11
85 bits

(Multiframe sync output is used for the oscilloscope trigger.)

Fig. 3-20 Output Waveforms

The main part of the frame signal generator is shown in Fig. 3-21. The timing chart of the main part is shown in Fig. 3-22.

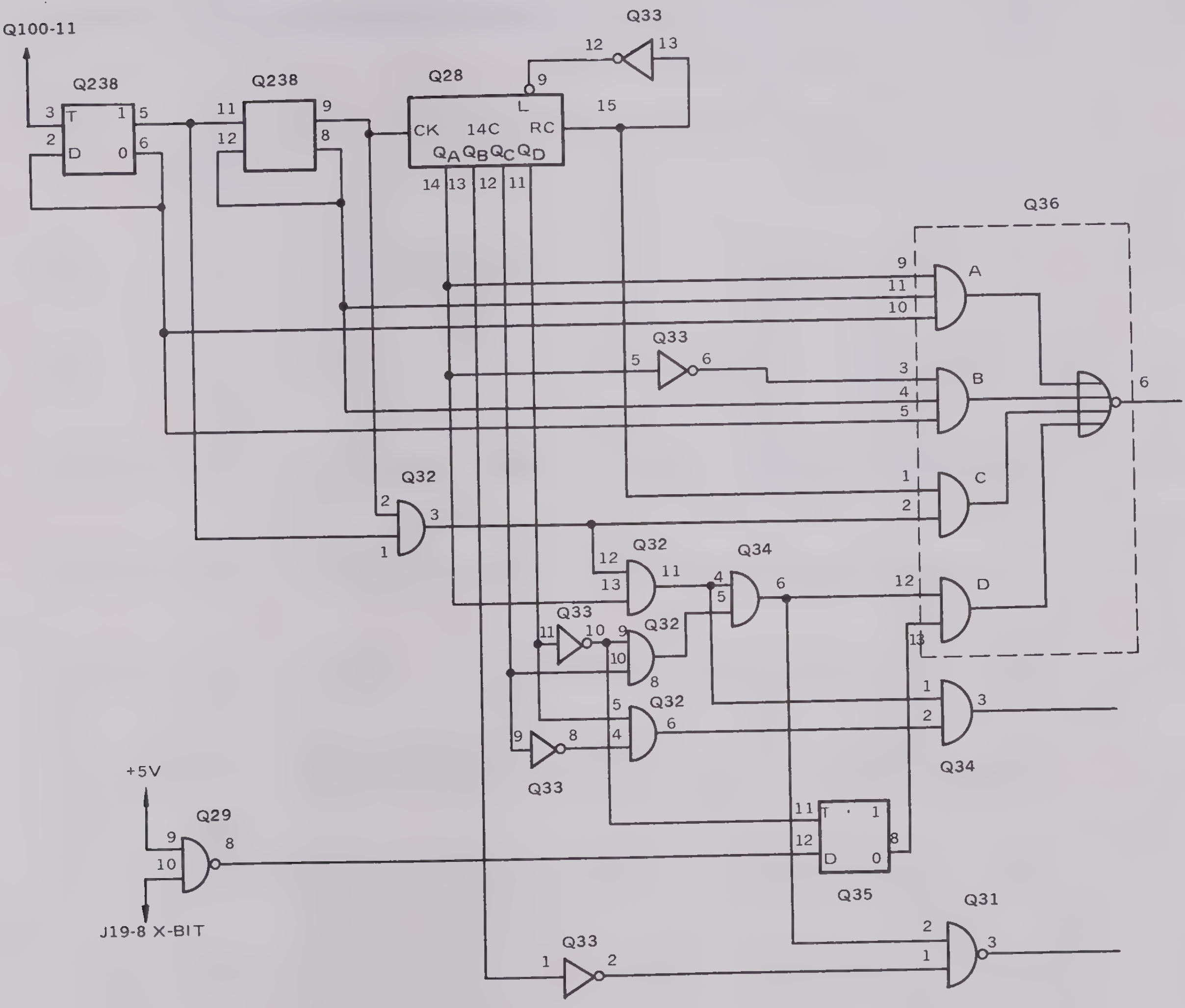

Q100-11
Q238
3
2
T
D
1
0
5
6
Q238
11
12
9
8
Q28
CK
14C
RC
L
9
QA QB QC QD
14
13
12
11
15
Q33
12
13
Q36
A
9
11
10
Q33
5
6
B
3
4
5
6
Q32
2
1
3
C
1
2
Q32
12
13
11
Q34
4
5
6
D
12
13
Q33
11
10
Q32
9
10
8
Q32
5
4
6
Q33
9
8
Q34
1
2
3
+5V
Q29
9
10
8
J19-8 X-BIT
Q35
11
12
T
1
D
0
8
Q31
2
1
3
Q33
1
2

Fig. 3-21 Frame Signal Generator

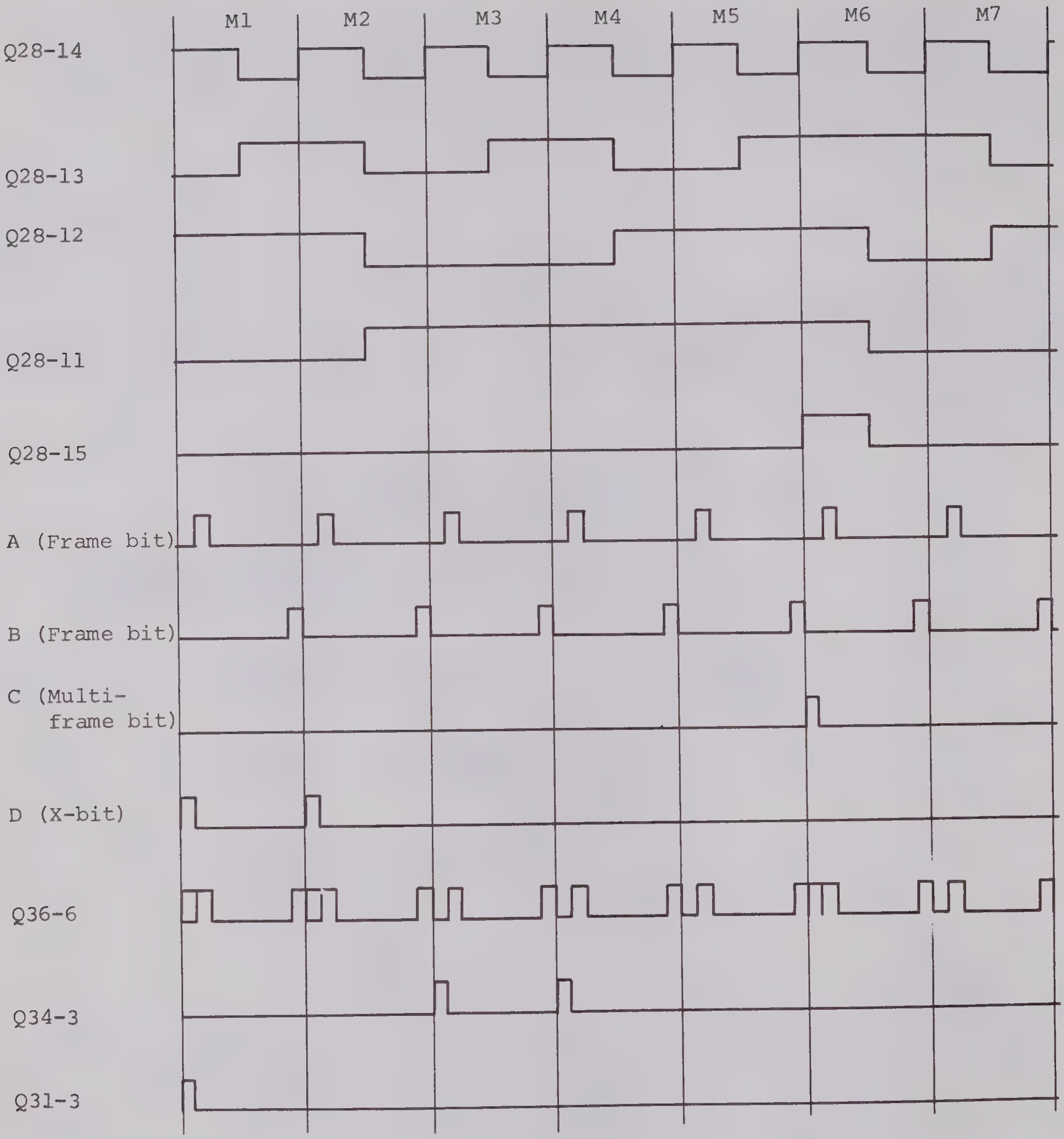

M1
M2
M3
M4
M5
M6
M7
Q28-14
Q28-13
Q28-12
Q28-11
Q28-15
A (Frame bit)
B (Frame bit)
C (Multi-frame bit)
D (X-bit)
Q36-6
Q34-3
Q31-3

Fig. 3-22 Frame Signal Generator Timing Chart

Since A to D are inside of an IC, their waveforms cannot be observed. A and B each generate a frame bits (1001) "1". C generates the multiframe bits (010) "1". D generates the X-bit at both Q29 and Q35. Q34-3 is pulses for generating the parity bit. Q31-3 is the pulse for reading the parity (Q22 to Q26 in Z3) calculated from the output pattern.

3.2.12 Pattern Generator Troubleshooting

Refer to 5 Pattern Generator (Z3) 43W30645 (2/15)

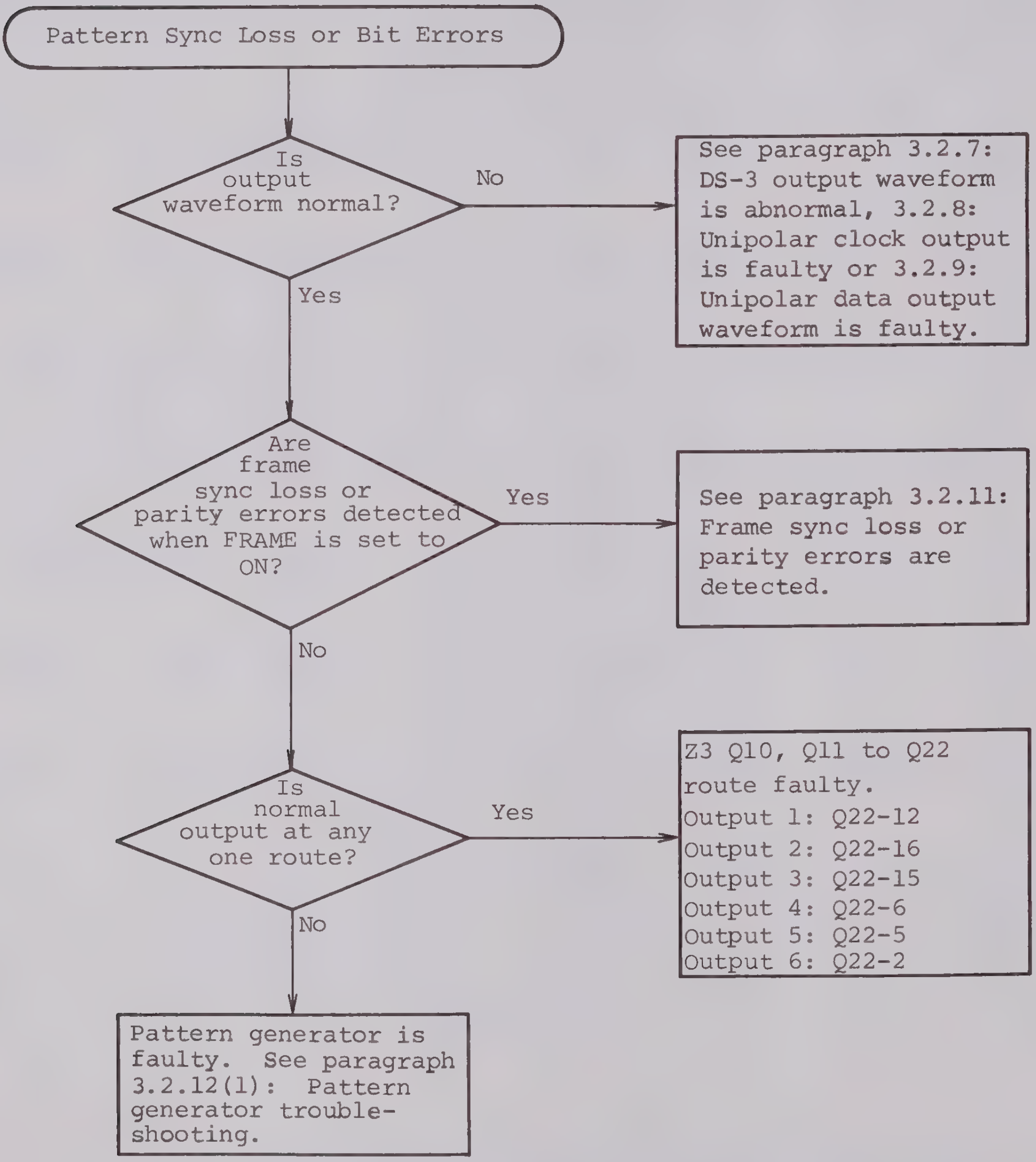

Pattern Sync Loss or Bit Errors
Is output waveform normal?
No
See paragraph 3.2.7: DS-3 output waveform is abnormal, 3.2.8: Unipolar clock output is faulty or 3.2.9: Unipolar data output waveform is faulty.
Yes
Are frame sync loss or parity errors detected when FRAME is set to ON?
Yes
See paragraph 3.2.11: Frame sync loss or parity errors are detected.
No
Is normal output at any one route?
Yes
Z3 Q10, Q11 to Q22 route faulty.
Output 1: Q22-12
Output 2: Q22-16
Output 3: Q22-15
Output 4: Q22-6
Output 5: Q22-5
Output 6: Q22-2
No
Pattern generator is faulty. See paragraph 3.2.12(1): Pattern generator trouble-shooting.

Fig. 3-20 Pattern Generator Troubleshooting Flowchart

3.2.12 (1) Pattern Generator

The PRBS (Pseudo-Random Bit Sequence) pattern and fixed pattern are generated from a common circuit. The generation circuit for the patterns is shown in Figs. 3-24 to 3-27. Although not shown in Figs. 3-24 to 3-27, the exclusive-OR gate of Q13, Q14, and Q15 in Z3 provides a phase difference between the outputs for PRBS pattern.

These circuits are also used for the fixed pattern. The same fixed pattern as the fixed pattern circuit is finally obtained from the logical expressions

$$X^n + X^{n+4} = X^n + X^n = 0.$$

The signal of Q16-4 in Fig. 3-26 or 3-27 is for constantly continuing the 1010 pattern after the frame bit.

Q10 and Q11 are an 8-bit register.

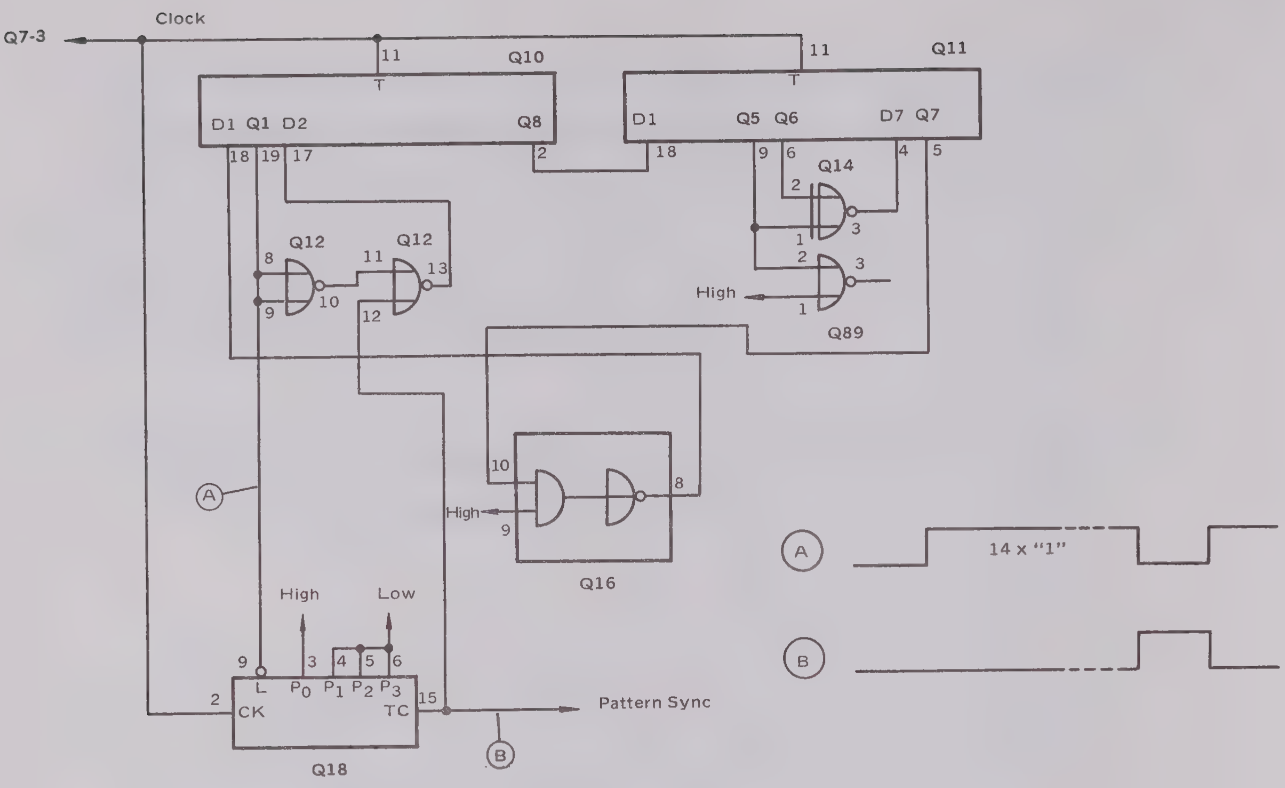

Q7-3
Clock
11
Q10
T
D1 Q1 D2
Q8
18 19 17
2
11
Q11
T
D1
Q5 Q6
D7 Q7
18
9 6
4 5
Q14
2
1
3
2
3
High
1
Q89
Q12
8
9
10
Q12
11
13
12
A
10
High
9
8
Q16
A
14 x "1"
B
High
Low
9
3
4
5
6
L
P0 P1 P2 P3
2
CK
TC
15
Pattern Sync
B
Q18

Fig. 3-24 PRBS Pattern Generator

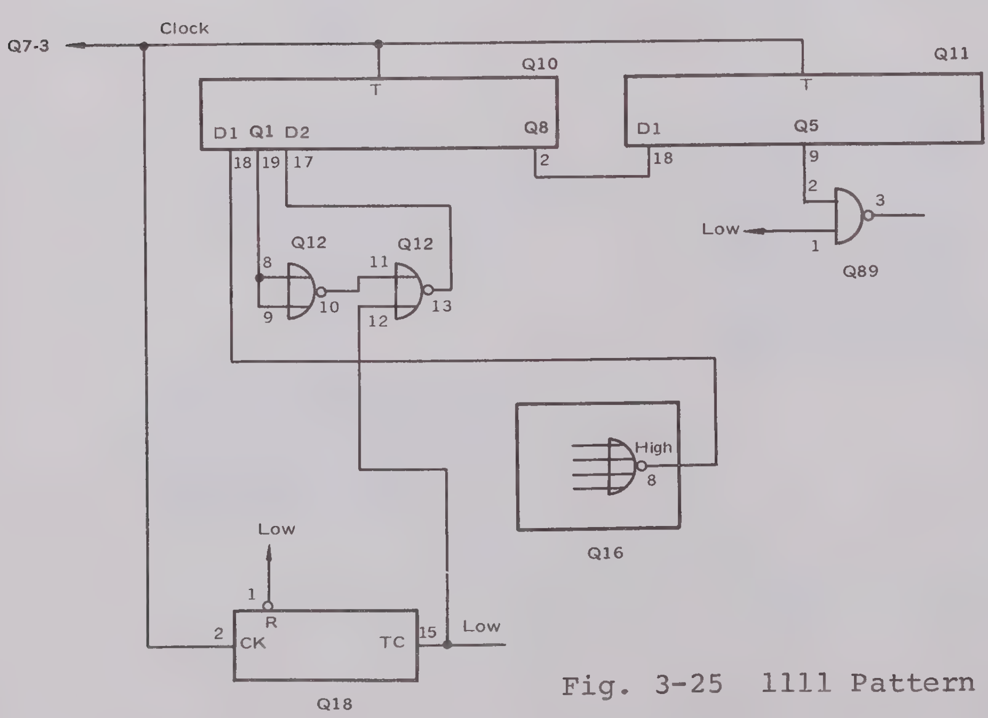

Q7-3
Clock
Q10
T
D1 Q1 D2
Q8
18 19 17
2
Q11
T
D1
Q5
18
9
2
3
Low
1
Q89
Q12
8
9
10
Q12
11
13
12
High
8
Q16
Low
1
R
2
CK
TC
15
Low
Q18

Fig. 3-25 1111 Pattern Generators

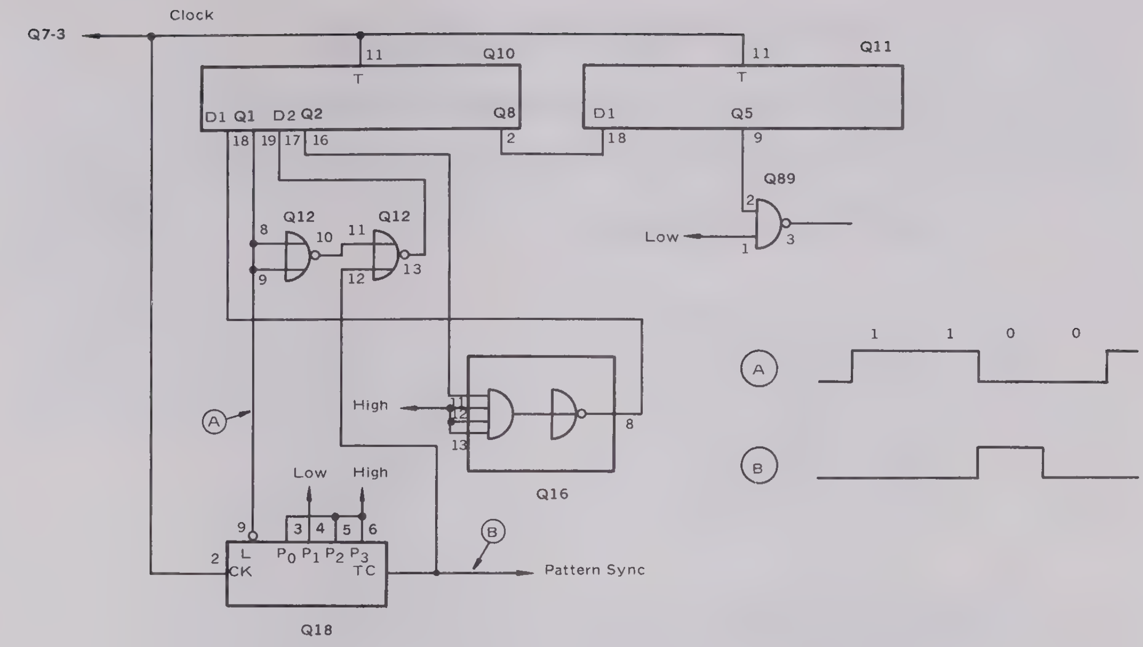

Clock
Q7-3
Q10
Q11
T
D1 Q1 D2 Q2
Q8
D1
Q5
18 19 17 16
2
18
9
11
Q89
Low
Q12
Q12
8 10 11 13 9 12
High
11 12 13
8
Q16
A
Low
High
9 3 4 5 6
2
L P0 P1 P2 P3
CK TC
B
Pattern Sync
Q18
1 1 0 0
A
B

Fig. 3-26 1100 Pattern Generator

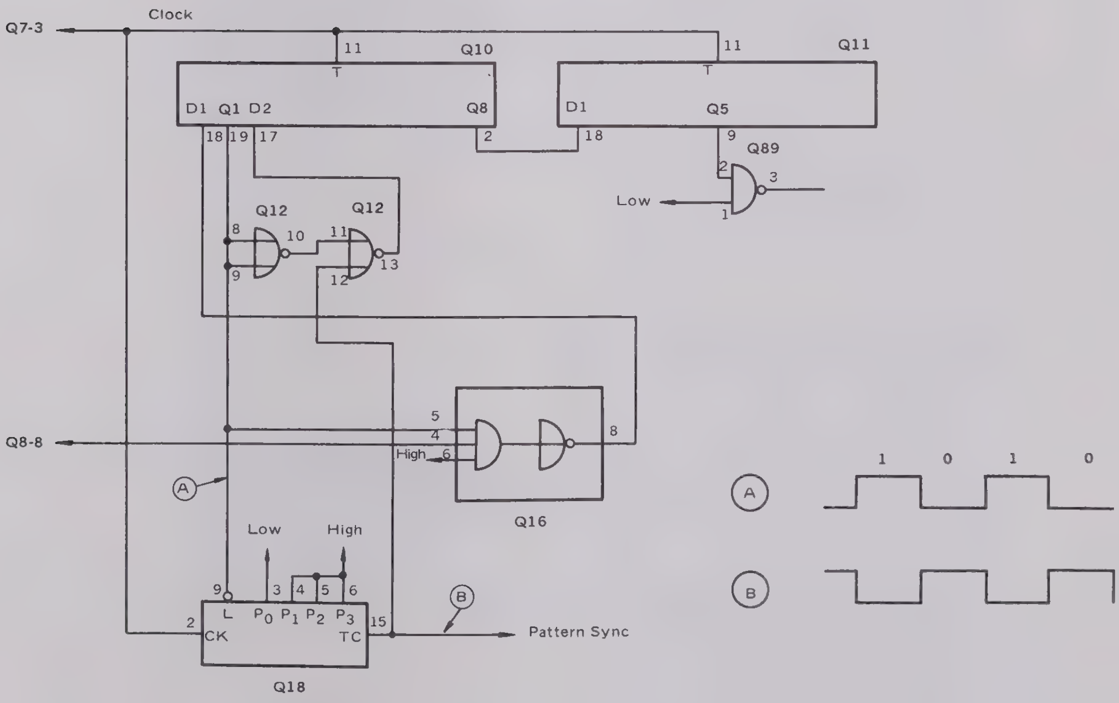

Clock
Q7-3
Q10
Q11
T
D1 Q1 D2
Q8
D1
Q5
18 19 17
2
18
9
Q89
Low
3
Q12
Q12
8 10 11 13 9 12
Q8-8
5
4
High 6
8
Q16
A
Low
High
9 3 4 5 6
2
L P0 P1 P2 P3
CK TC
15
B
Pattern Sync
Q18
1 0 1 0
A
B

Fig. 3-27 1010 Pattern Generators

3.2.13 Error Addition Circuit Troubleshooting

Refer to
3 Overall Circuit of Transmitter, 43W30643 (2/2)
4 Power Supply Circuit (Z2) 43W30644 (4/5, 5/5)
5 Pattern Generator (Z3) 43W30645 (2/15 to 5/15, 14/15)

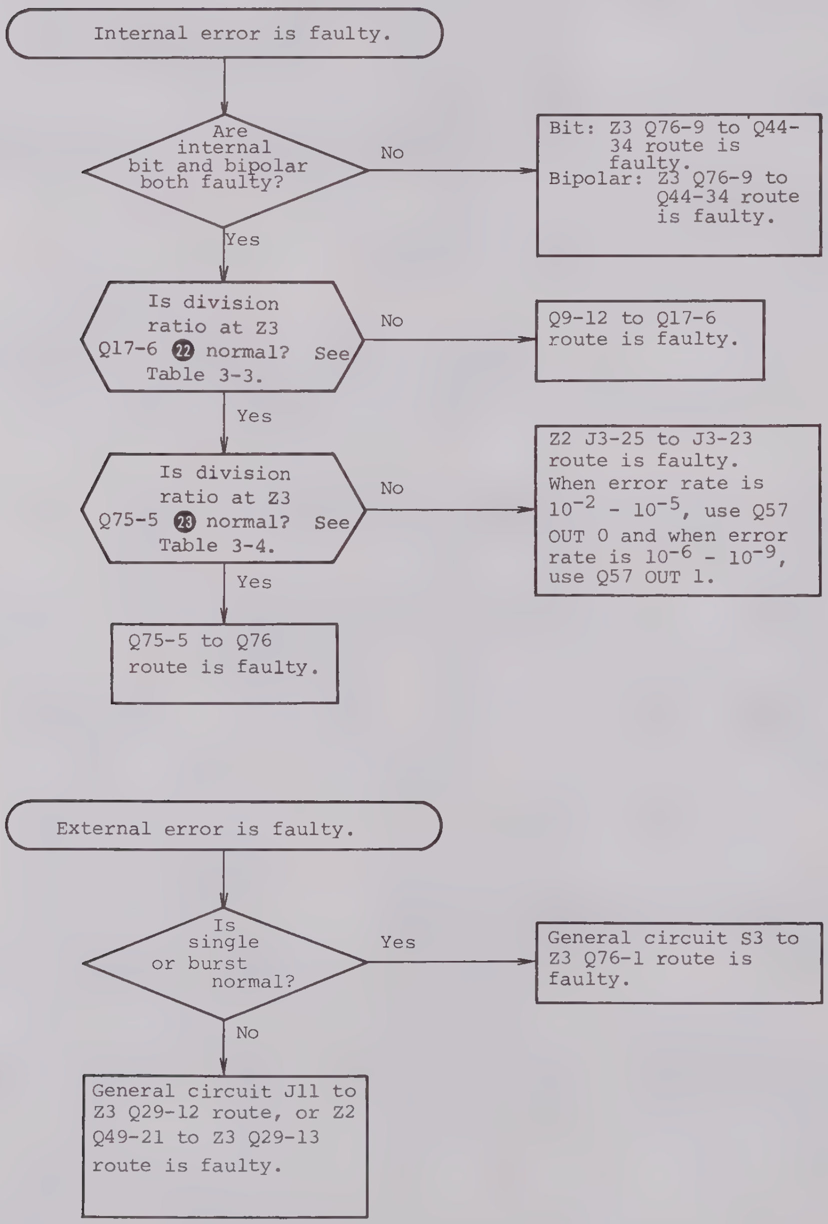

Internal error is faulty.
Are internal bit and bipolar both faulty?
No
Bit: Z3 Q76-9 to Q44-34 route is faulty.
Bipolar: Z3 Q76-9 to Q44-34 route is faulty.
Yes
Is division ratio at Z3 Q17-6 ㉒ normal? See Table 3-3.
No
Q9-12 to Q17-6 route is faulty.
Yes
Is division ratio at Z3 Q75-5 ㉓ normal? See Table 3-4.
No
Z2 J3-25 to J3-23 route is faulty. When error rate is 10⁻² - 10⁻⁵, use Q57 OUT 0 and when error rate is 10⁻⁶ - 10⁻⁹, use Q57 OUT 1.
Yes
Q75-5 to Q76 route is faulty.
External error is faulty.
Is single or burst normal?
Yes
General circuit S3 to Z3 Q76-1 route is faulty.
No
General circuit J11 to Z3 Q29-12 route, or Z2 Q49-21 to Z3 Q29-13 route is faulty.

Fig. 3-28 Error Addition Circuit Troubleshooting Flowchart

Table 3-3 Division ratio (I)

Setting	Division ratio (for clock)
Frame-OFF	25
Frame-ON and Error Rate 10^{-3} or 10^{-5}	27
Frame-ON and Error Rate 10^{-2}, 10^{-4}, 10^{-6}, 10^{-9}	33

Table 3-4 Division ratio (II)

Setting	Division ratio (for Q17-6)	
	Frame-OFF	Frame-ON
Error Rate 10^{-2}	4	3
Error Rate 10^{-3}	4 x 10	37
Error Rate 10^{-4}	4×10^2	303
Error Rate 10^{-5}	4×10^3	3,704
Error Rate 10^{-6}	4×10^4	30,303
Error Rate 10^{-7}	4×10^5	303,031
Error Rate 10^{-8}	4×10^6	3,030,303
Error Rate 10^{-9}	4×10^7	30,303,031

3.2.14 Sync Output Circuit Troubleshooting

Refer to
3 Overall Circuit of Transmitter : 43W30643 (2/2)
5 Pattern Generator (Z3) 43W30645: (1/15, 2/15, 4/15, 14/15)

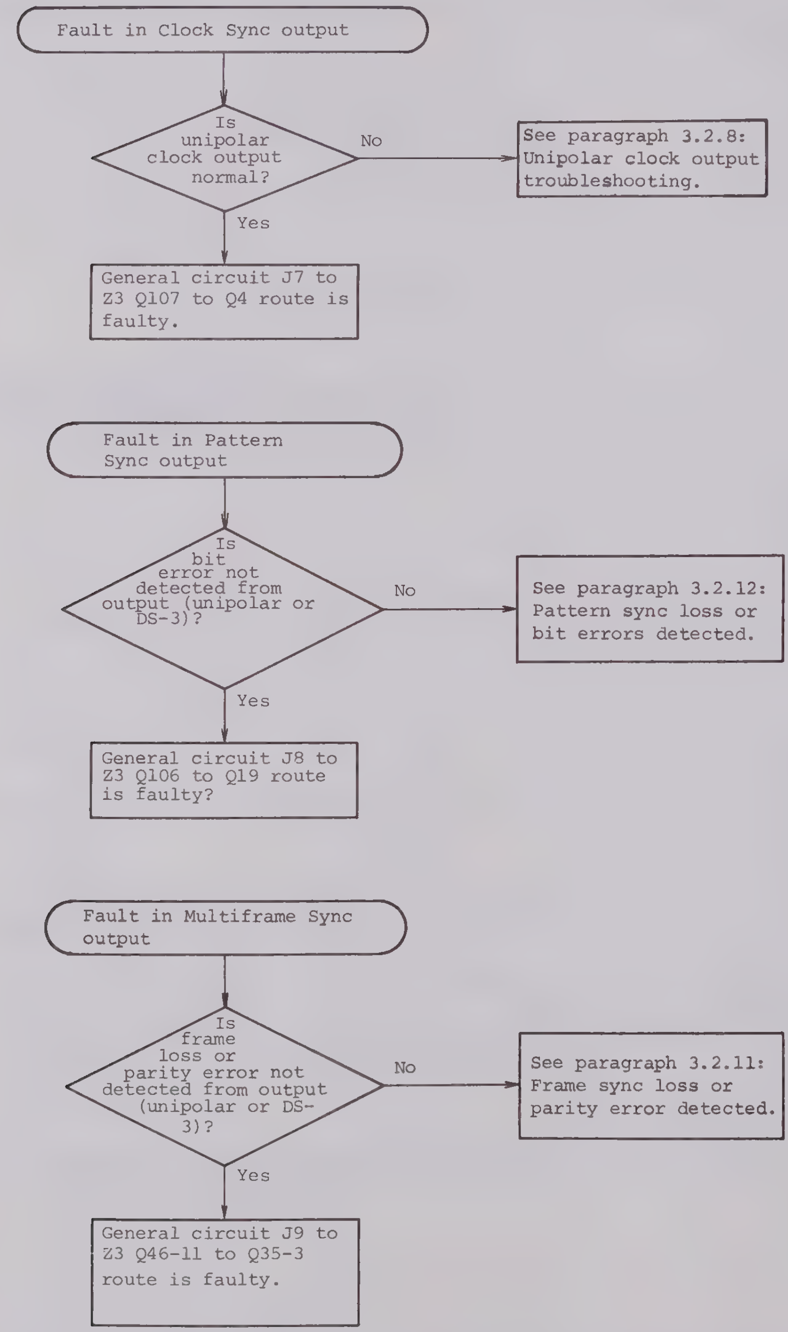

Fault in Clock Sync output
Is unipolar clock output normal?
No
See paragraph 3.2.8: Unipolar clock output troubleshooting.
Yes
General circuit J7 to Z3 Q107 to Q4 route is faulty.
Fault in Pattern Sync output
Is bit error not detected from output (unipolar or DS-3)?
No
See paragraph 3.2.12: Pattern sync loss or bit errors detected.
Yes
General circuit J8 to Z3 Q106 to Q19 route is faulty?
Fault in Multiframe Sync output
Is frame loss or parity error not detected from output (unipolar or DS-3)?
No
See paragraph 3.2.11: Frame sync loss or parity error detected.
Yes
General circuit J9 to Z3 Q46-11 to Q35-3 route is faulty.

Fig. 3-29 Sync Output Circuit Troubleshooting Flowchart

3.2.15 Control Circuit Troubleshooting

Refer to 4 Power Supply Circuit (Z2): 43W30644 (1/5 to 5/5)

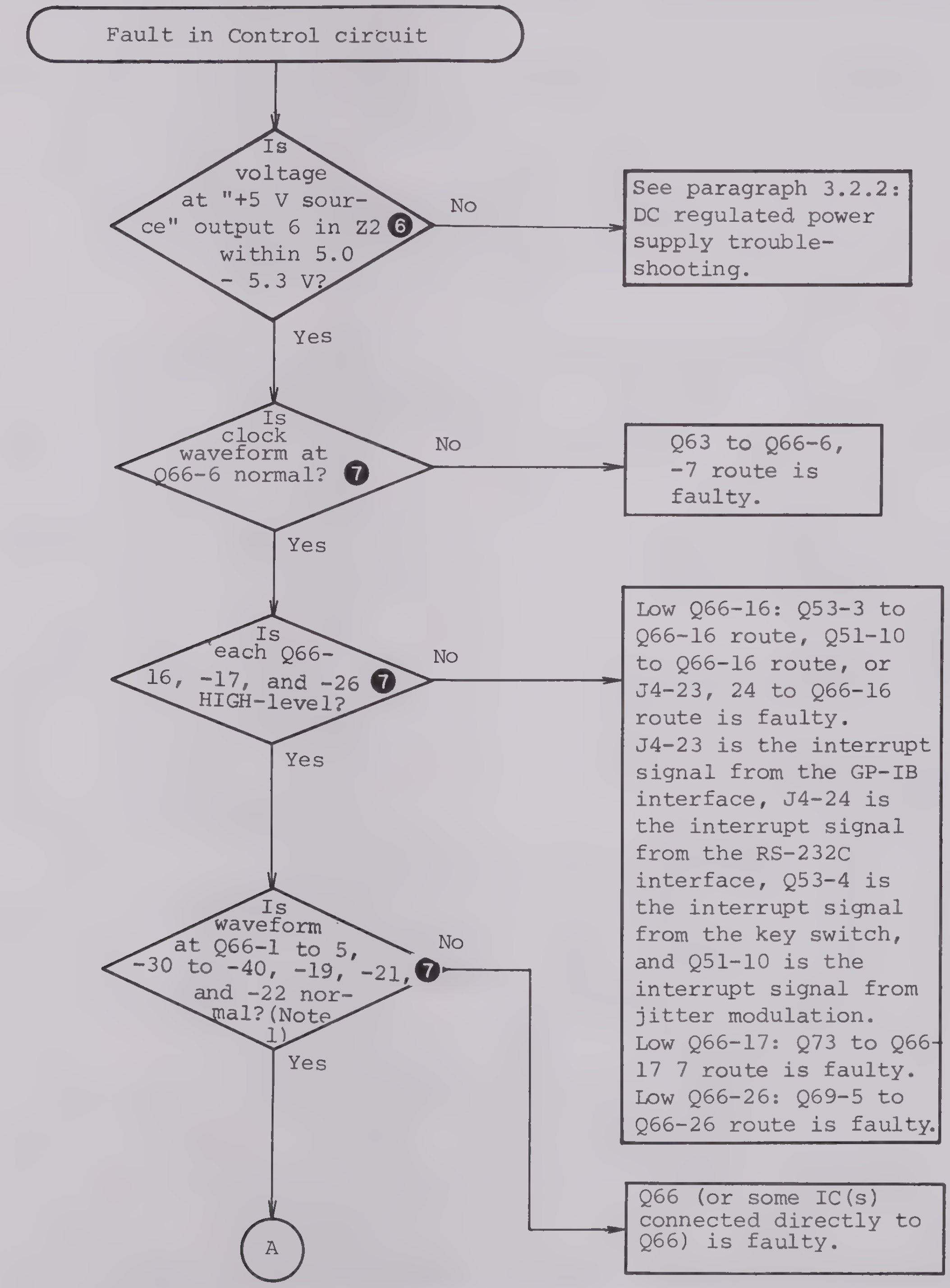

Fault in Control circuit
Is voltage at "+5 V source" output 6 in Z2 ❻ within 5.0 - 5.3 V?
No
See paragraph 3.2.2: DC regulated power supply troubleshooting.
Yes
Is clock waveform at Q66-6 normal? ❼
No
Q63 to Q66-6, -7 route is faulty.
Yes
Is each Q66-16, -17, and -26 ❼ HIGH-level?
No
Low Q66-16: Q53-3 to Q66-16 route, Q51-10 to Q66-16 route, or J4-23, 24 to Q66-16 route is faulty. J4-23 is the interrupt signal from the GP-IB interface, J4-24 is the interrupt signal from the RS-232C interface, Q53-4 is the interrupt signal from the key switch, and Q51-10 is the interrupt signal from jitter modulation. Low Q66-17: Q73 to Q66-17 7 route is faulty. Low Q66-26: Q69-5 to Q66-26 route is faulty.
Yes
Is waveform at Q66-1 to 5, -30 to -40, -19, -21, ❼ and -22 normal? (Note 1)
No
Q66 (or some IC(s) connected directly to Q66) is faulty.
Yes
A

Fig. 3-30 Control Circuit Troubleshooting Flowchart (1/2)

Note

When a pulse is not output from any of these terminals, if that High/Low level is +2.4 V or more/0.5 V or less, since it is often caused by a fault at another circuit, proceed to the flow after the next before going to "YES".

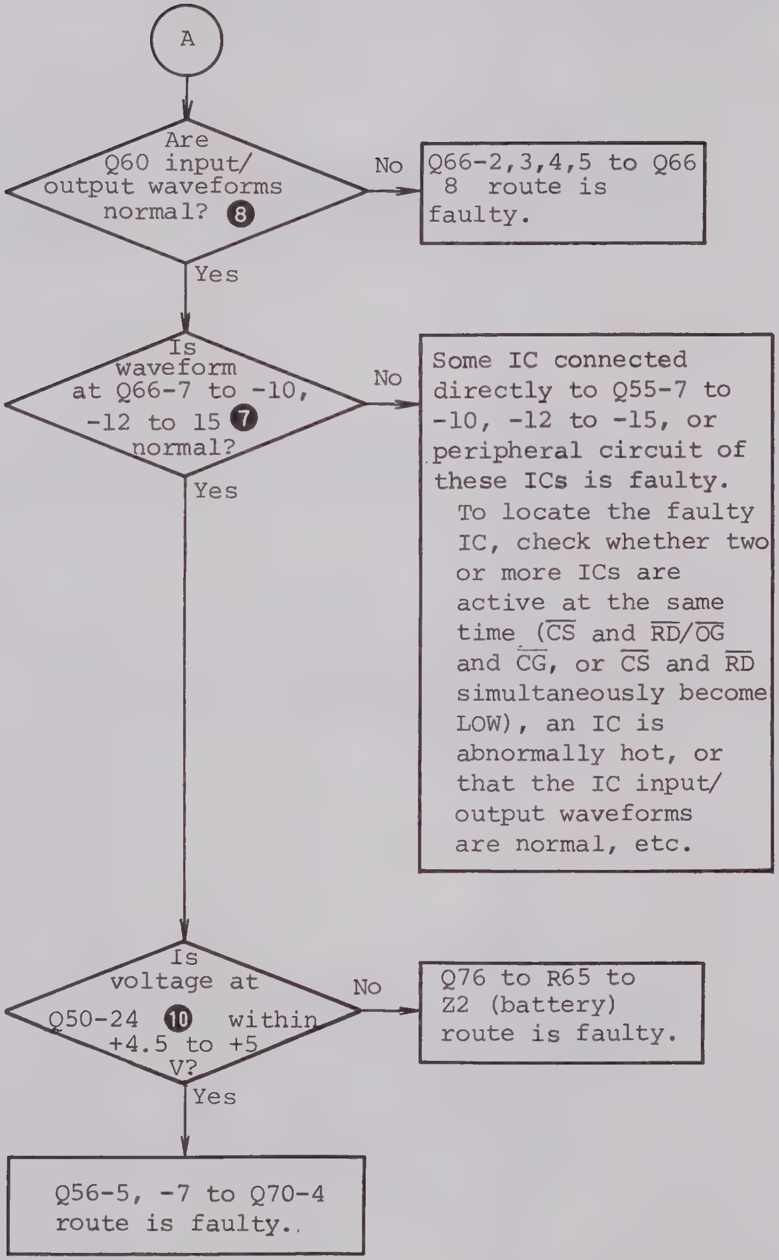

A
Are Q60 input/ output waveforms normal? ❽
No
Q66-2,3,4,5 to Q66 8 route is faulty.
Yes
Is waveform at Q66-7 to -10, -12 to 15 ❼ normal?
No
Some IC connected directly to Q55-7 to -10, -12 to -15, or peripheral circuit of these ICs is faulty.
To locate the faulty IC, check whether two or more ICs are active at the same time ($\overline{CS}$ and $\overline{RD}$/$\overline{OG}$ and $\overline{CG}$, or $\overline{CS}$ and $\overline{RD}$ simultaneously become LOW), an IC is abnormally hot, or that the IC input/ output waveforms are normal, etc.
Yes
Is voltage at Q50-24 ❿ within +4.5 to +5 V?
No
Q76 to R65 to Z2 (battery) route is faulty.
Yes
Q56-5, -7 to Q70-4 route is faulty.

Fig. 3-30 (Cont.) Control Circuit Troubleshooting Flowchart

3.2.16 GP-IB or RS-232C Interface Troubleshooting

Refer to $\boxed{4}$ Power Supply Circuit (Z2): 43W30644 (2/5, 3/5, 5/5)

Make the checks below by referring to subsection 4.4.10 "GP-IB interface"/4.4.11 "RS-232C interface check" of the Operation Manual and then executing the program.

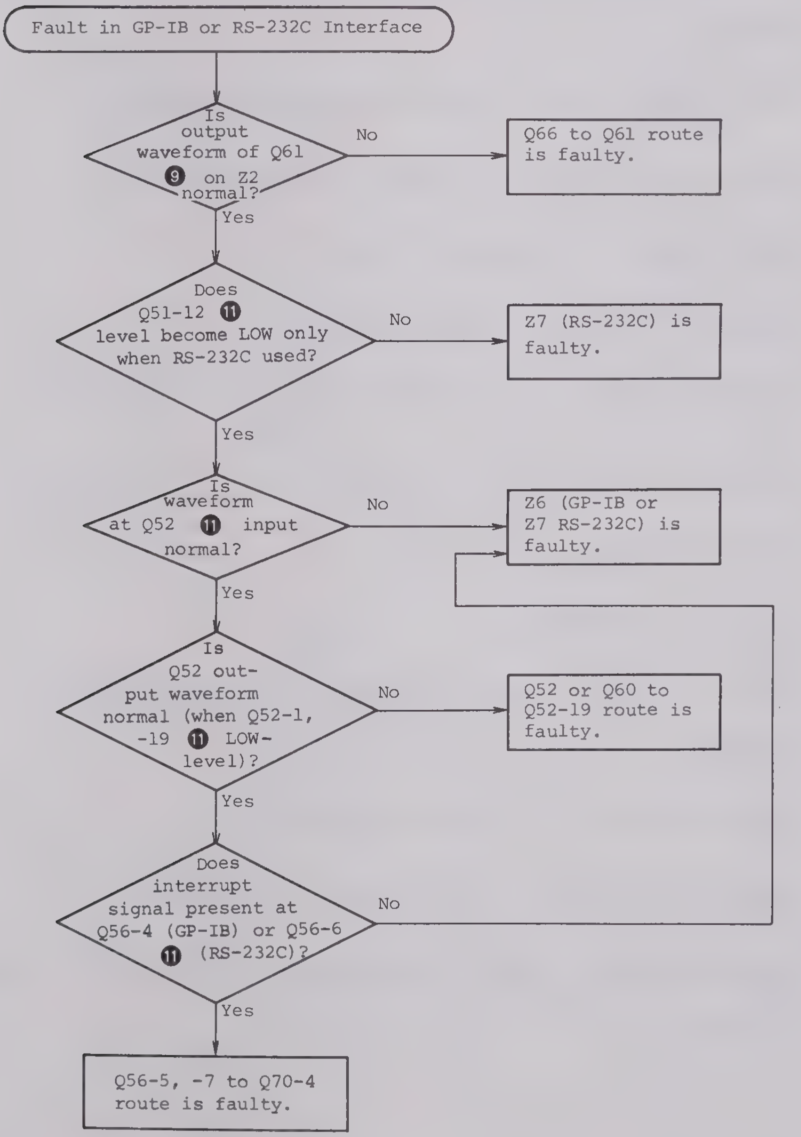

Fault in GP-IB or RS-232C Interface
Is output waveform of Q61 ❾ on Z2 normal?
No
Q66 to Q61 route is faulty.
Yes
Does Q51-12 ⓫ level become LOW only when RS-232C used?
No
Z7 (RS-232C) is faulty.
Yes
Is waveform at Q52 ⓫ input normal?
No
Z6 (GP-IB or Z7 RS-232C) is faulty.
Yes
Is Q52 output waveform normal (when Q52-1, -19 ⓫ LOW-level)?
No
Q52 or Q60 to Q52-19 route is faulty.
Yes
Does interrupt signal present at Q56-4 (GP-IB) or Q56-6 ⓫ (RS-232C)?
No
Yes
Q56-5, -7 to Q70-4 route is faulty.

Fig. 3-31 GP-IB or RS-232C Interface Troubleshooting Flowchart

3.3 Receiver Troubleshooting

When a failure occurs with the ME462B receiver, select the corresponding item from the following Troubleshooting items and make repairs in accordance with the flow in each one.

(1) Power-on lamp does not light.

(2) DC regulated power supply (+5 V, +24 V, -12 V) is faulty.

(3) Front panel LED or key switch is faulty.

(4) Errors detected for error-free signal.

(5) DS-3 input circuit is faulty.

(6) B3ZS reverse converter is faulty.

(7) Unipolar input circuit is faulty.

(8) Framing circuit is faulty.

(9) Error detector is faulty.

(10) Counter is faulty.

(11) Error seconds (ES) or error free seconds (EFS) are faulty.

(12) Alarm display or buzzer is faulty.

(13) Measuring time or real-time is faulty.

(14) Output (CLOCK SYNC, MULTIFRAME SYNC, X-BIT, ERROR) is faulty.

(15) Monitor input is faulty.

(16) Function switch is faulty.

(17) Control circuit is faulty.

(18) Printer is faulty.

(19) GP-IB or RS-232C interface is faulty.

3.3.1 Power-ON Lamp Troubleshooting

Refer to
- 10 Overall circuit of Receiver: 43W30647
- 11 Control Circuit (Z2) : 43W30649 (5/5)
- 12 Bit Error Detector (Z3) : 43W30648 (1/3)

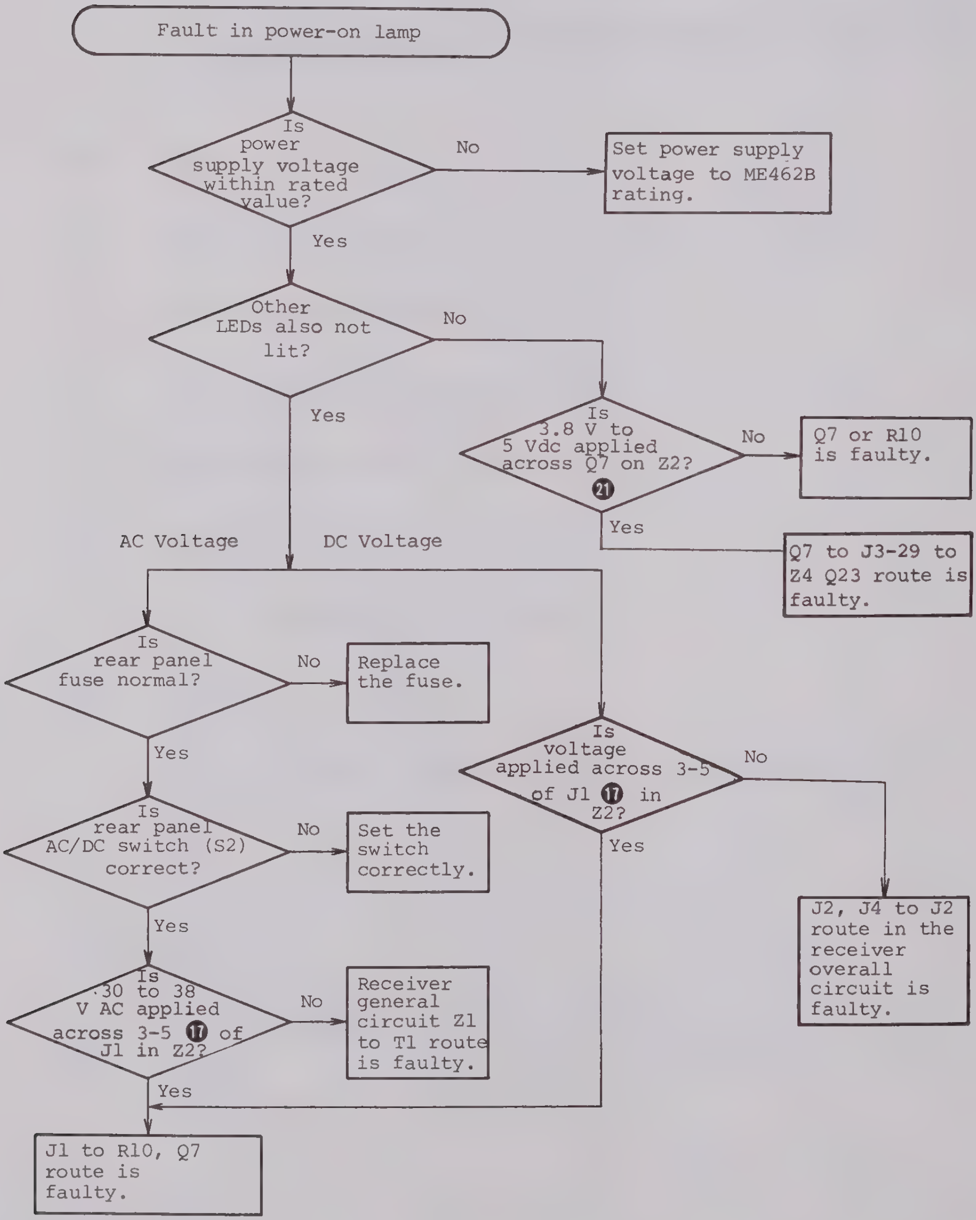
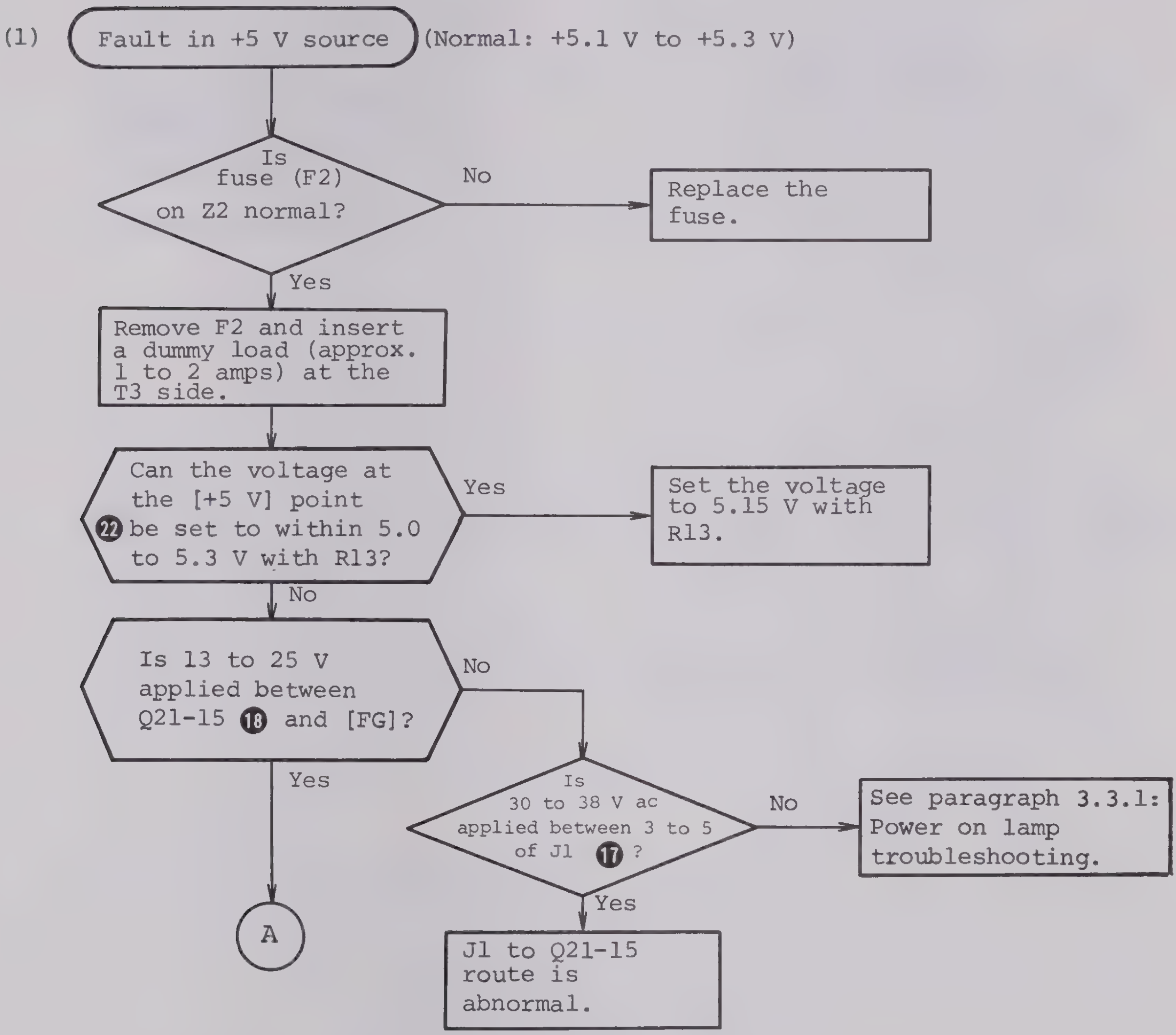

Fault in power-on lamp
Is power supply voltage within rated value?
No
Set power supply voltage to ME462B rating.
Yes
Other LEDs also not lit?
No
Is 3.8 V to 5 Vdc applied across Q7 on Z2? ㉑
No
Q7 or R10 is faulty.
Yes
Q7 to J3-29 to Z4 Q23 route is faulty.
Yes
AC Voltage
DC Voltage
Is rear panel fuse normal?
No
Replace the fuse.
Yes
Is rear panel AC/DC switch (S2) correct?
No
Set the switch correctly.
Yes
Is 30 to 38 V AC applied across 3-5 ⑰ of J1 in Z2?
No
Receiver general circuit Z1 to T1 route is faulty.
Yes
J1 to R10, Q7 route is faulty.
Is voltage applied across 3-5 of J1 ⑰ in Z2?
No
J2, J4 to J2 route in the receiver overall circuit is faulty.
Yes

Fig. 3-32 Power-ON Lamp Troubleshooting Flowchart

3.3.2 Regulated DC Power Supply Troubleshooting

Refer to 4 Power Supply Circuit (Z2): 43W30644 (5/5)



(1)
Fault in +5 V source
(Normal: +5.1 V to +5.3 V)
Is fuse (F2) on Z2 normal?
No
Replace the fuse.
Yes
Remove F2 and insert a dummy load (approx. 1 to 2 amps) at the T3 side.
Can the voltage at the [+5 V] point ㉒ be set to within 5.0 to 5.3 V with R13?
Yes
Set the voltage to 5.15 V with R13.
No
Is 13 to 25 V applied between Q21-15 ⑱ and [FG]?
No
Yes
A
Is 30 to 38 V ac applied between 3 to 5 of J1 ⑰ ?
No
See paragraph 3.3.1: Power on lamp troubleshooting.
Yes
J1 to Q21-15 route is abnormal.

Fig. 3-33 Regulated DC Power Supply Troubleshooting Flowchart (+5 V)

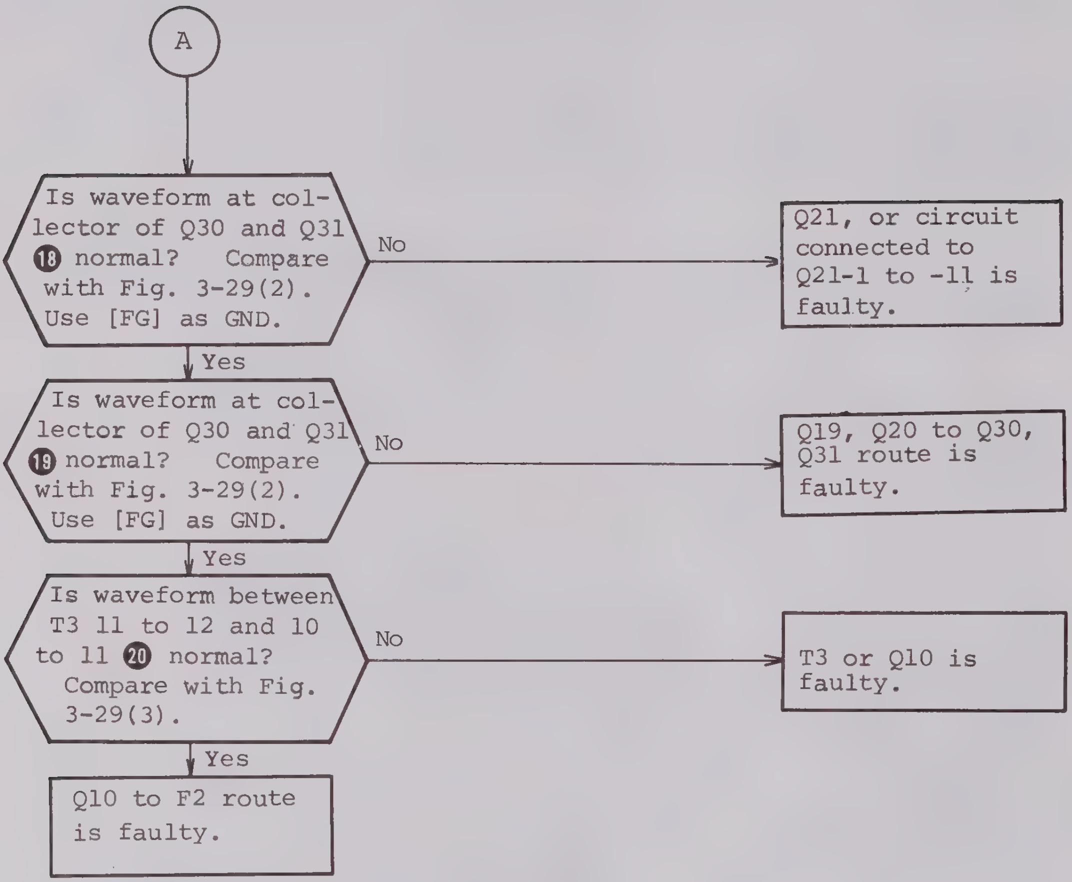

A
Is waveform at collector of Q30 and Q31 ⑱ normal? Compare with Fig. 3-29(2). Use [FG] as GND.
No
Q21, or circuit connected to Q21-1 to -11 is faulty.
Yes
Is waveform at collector of Q30 and Q31 ⑲ normal? Compare with Fig. 3-29(2). Use [FG] as GND.
No
Q19, Q20 to Q30, Q31 route is faulty.
Yes
Is waveform between T3 11 to 12 and 10 to 11 ⑳ normal? Compare with Fig. 3-29(3).
No
T3 or Q10 is faulty.
Yes
Q10 to F2 route is faulty.

Fig. 3-33 (Cont.) Regulated DC Power Supply Troubleshooting Flowchart (+5 V)

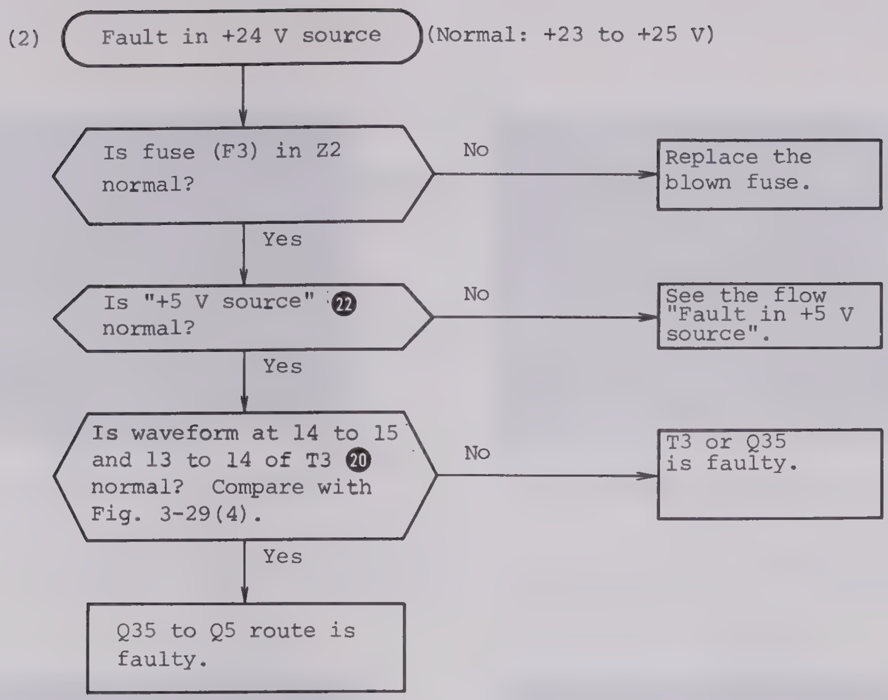

(2)
Fault in +24 V source
(Normal: +23 to +25 V)
Is fuse (F3) in Z2 normal?
No
Replace the blown fuse.
Yes
Is "+5 V source" ㉒ normal?
No
See the flow "Fault in +5 V source".
Yes
Is waveform at 14 to 15 and 13 to 14 of T3 ⑳ normal? Compare with Fig. 3-29(4).
No
T3 or Q35 is faulty.
Yes
Q35 to Q5 route is faulty.

Fig. 3-34 Regulated DC Power Supply Troubleshooting Flowchart (-12 V)

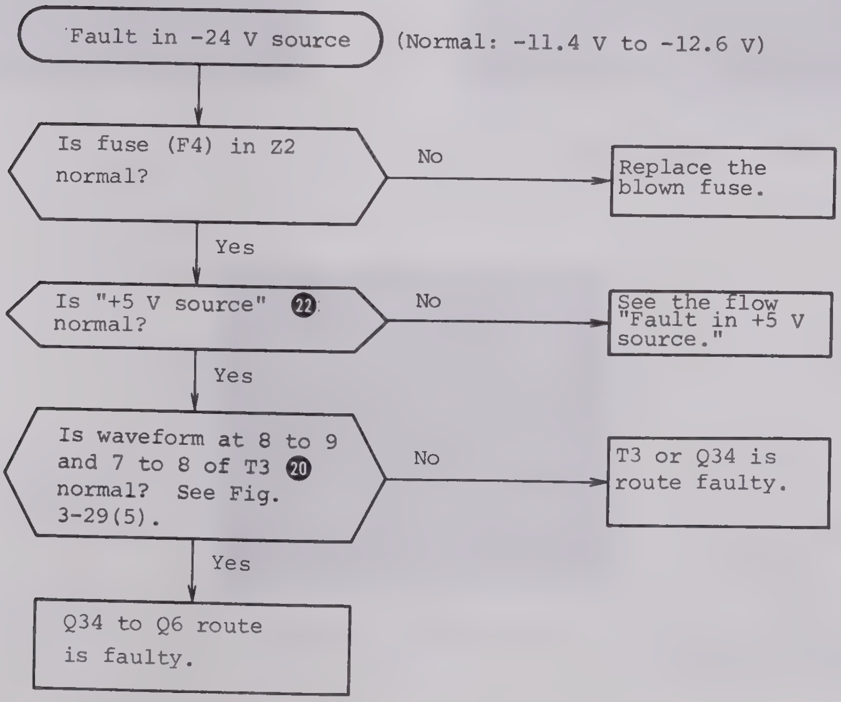
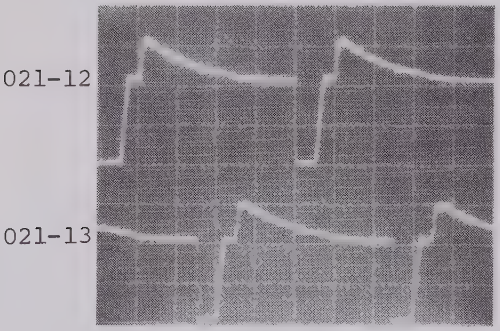
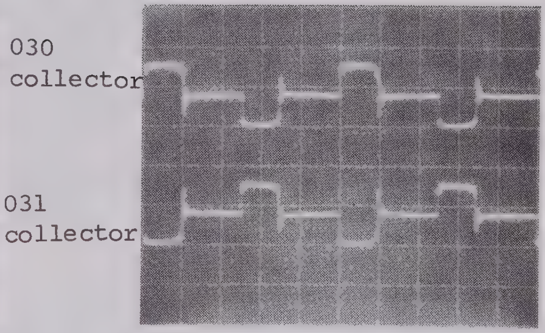

Fault in -24 V source
(Normal: -11.4 V to -12.6 V)
Is fuse (F4) in Z2 normal?
No
Replace the blown fuse.
Yes
Is "+5 V source" ㉒ normal?
No
See the flow "Fault in +5 V source."
Yes
Is waveform at 8 to 9 and 7 to 8 of T3 ⑳ normal? See Fig. 3-29(5).
No
T3 or Q34 is route faulty.
Yes
Q34 to Q6 route is faulty.

Fig. 3-35 Regulated DC Power Supply Troubleshooting Flowchart (-12 V)



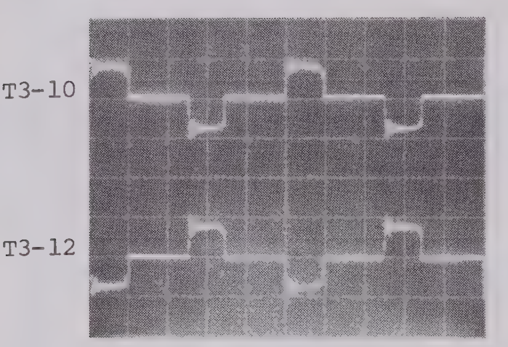
10 V/div, 5 µs/div

(1)



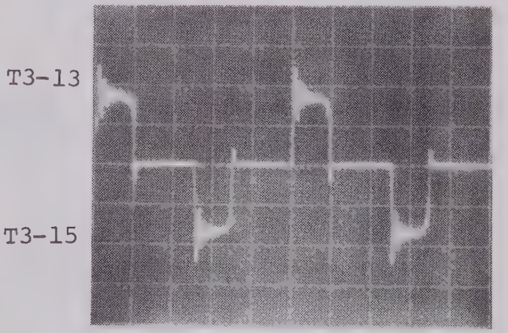
50 V/div, 5 µs/div

(2)



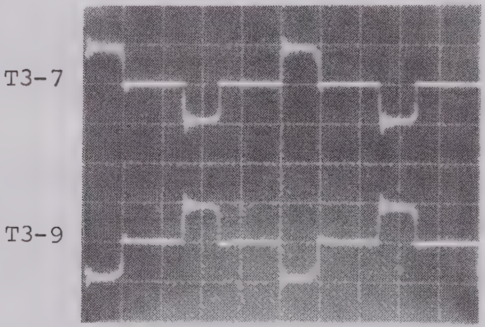
20 V/div, 5 µs/div

(3)



50 V/div, 5 µs/div

(4)



50 V/div, 5 µs/div

(5)

Fig. 3-29 Waveforms of Main Parts of Receiver Power Supply Circuit

3.3.3 Front Panel LED or Key Switch Troubleshooting

Refer to
- 4 Power Supply Circuit (Z2): 43W30644 (2/5, 4/5)
- 6 Front Panel Circuit (Z4) : 43W30646 (1/3 to 3/3)

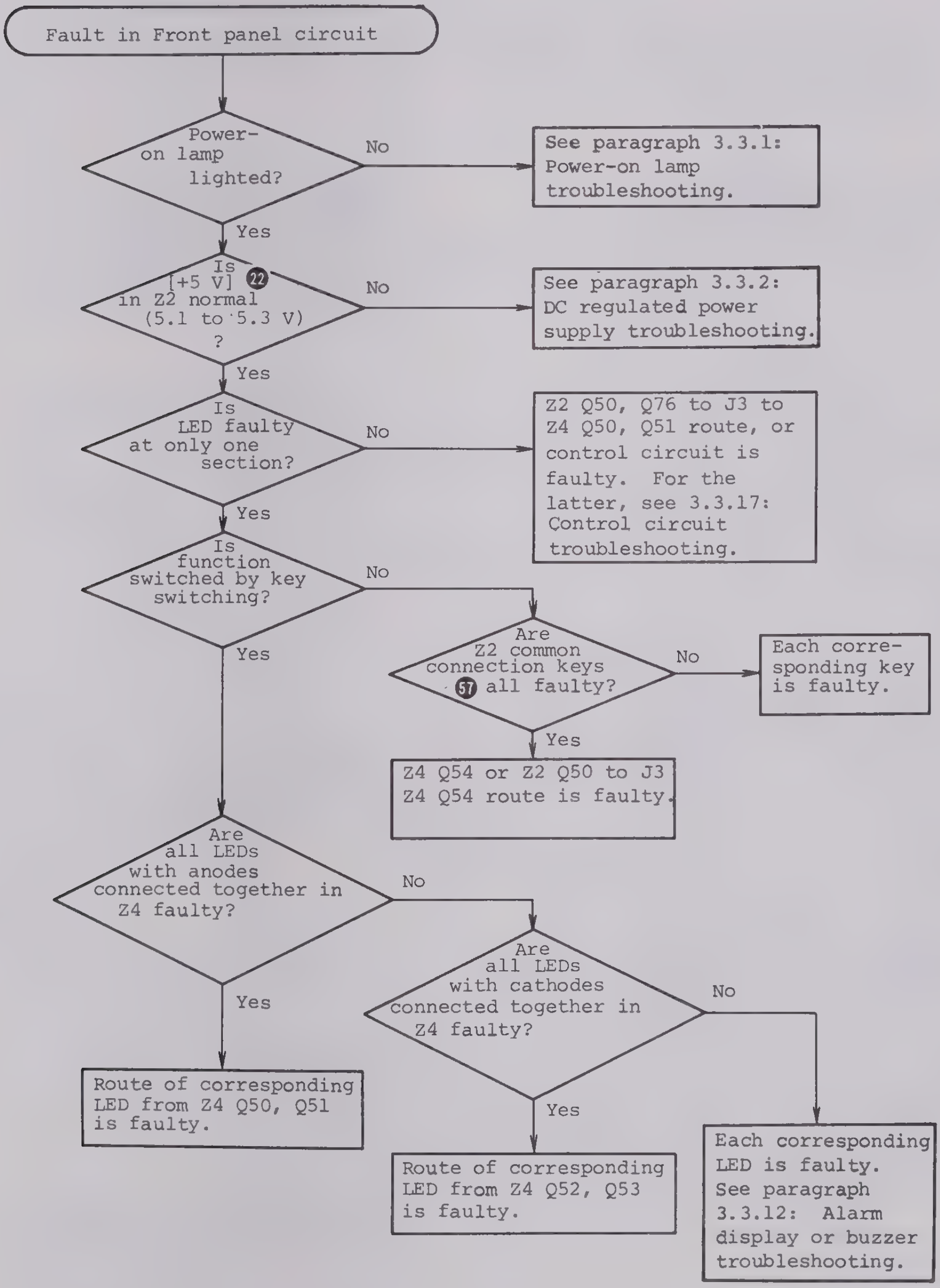

Fault in Front panel circuit
Power-on lamp lighted?
No
See paragraph 3.3.1: Power-on lamp troubleshooting.
Yes
Is [+5 V] ㉒ in Z2 normal (5.1 to 5.3 V) ?
No
See paragraph 3.3.2: DC regulated power supply troubleshooting.
Yes
Is LED faulty at only one section?
No
Z2 Q50, Q76 to J3 to Z4 Q50, Q51 route, or control circuit is faulty. For the latter, see 3.3.17: Control circuit troubleshooting.
Yes
Is function switched by key switching?
No
Are Z2 common connection keys (57) all faulty?
No
Each corresponding key is faulty.
Yes
Z4 Q54 or Z2 Q50 to J3 Z4 Q54 route is faulty.
Yes
Are all LEDs with anodes connected together in Z4 faulty?
Yes
Route of corresponding LED from Z4 Q50, Q51 is faulty.
No
Are all LEDs with cathodes connected together in Z4 faulty?
Yes
Route of corresponding LED from Z4 Q52, Q53 is faulty.
No
Each corresponding LED is faulty. See paragraph 3.3.12: Alarm display or buzzer troubleshooting.

Fig. 3-37 Front Panel LED or Key Switch Troubleshooting Flowchart

3.3.4 Error Circuit Troubleshooting

Refer to 12 Bit Error Detector (Z3): 43W30648 (2/10 to 4/10)

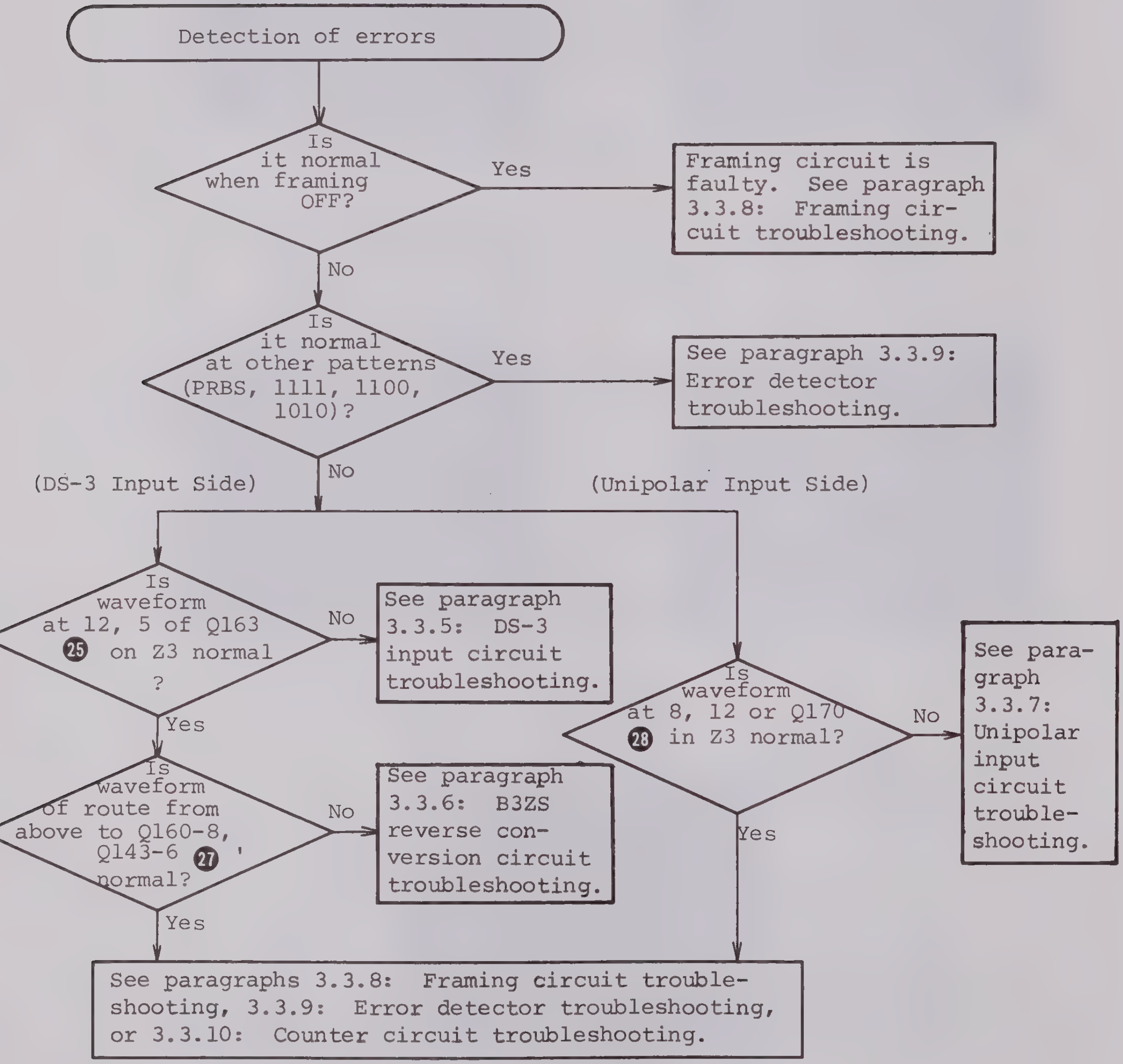

Detection of errors
Is it normal when framing OFF?
Yes
Framing circuit is faulty. See paragraph 3.3.8: Framing circuit troubleshooting.
No
Is it normal at other patterns (PRBS, 1111, 1100, 1010)?
Yes
See paragraph 3.3.9: Error detector troubleshooting.
No
(DS-3 Input Side)
(Unipolar Input Side)
Is waveform at 12, 5 of Q163 ㉕ on Z3 normal ?
No
See paragraph 3.3.5: DS-3 input circuit troubleshooting.
Yes
Is waveform of route from above to Q160-8, Q143-6 ㉗ normal?
No
See paragraph 3.3.6: B3ZS reverse conversion circuit troubleshooting.
Yes
Is waveform at 8, 12 or Q170 ㉘ in Z3 normal?
No
See paragraph 3.3.7: Unipolar input circuit troubleshooting.
Yes
See paragraphs 3.3.8: Framing circuit troubleshooting, 3.3.9: Error detector troubleshooting, or 3.3.10: Counter circuit troubleshooting.

Fig. 3-38 Error Circuit Troubleshooting Flowchart

3.3.5 DS-3 Input Circuit Troubleshooting

Refer to 12 Bit Error Detector (Z3): 43W30648 (1/10, 2/10)

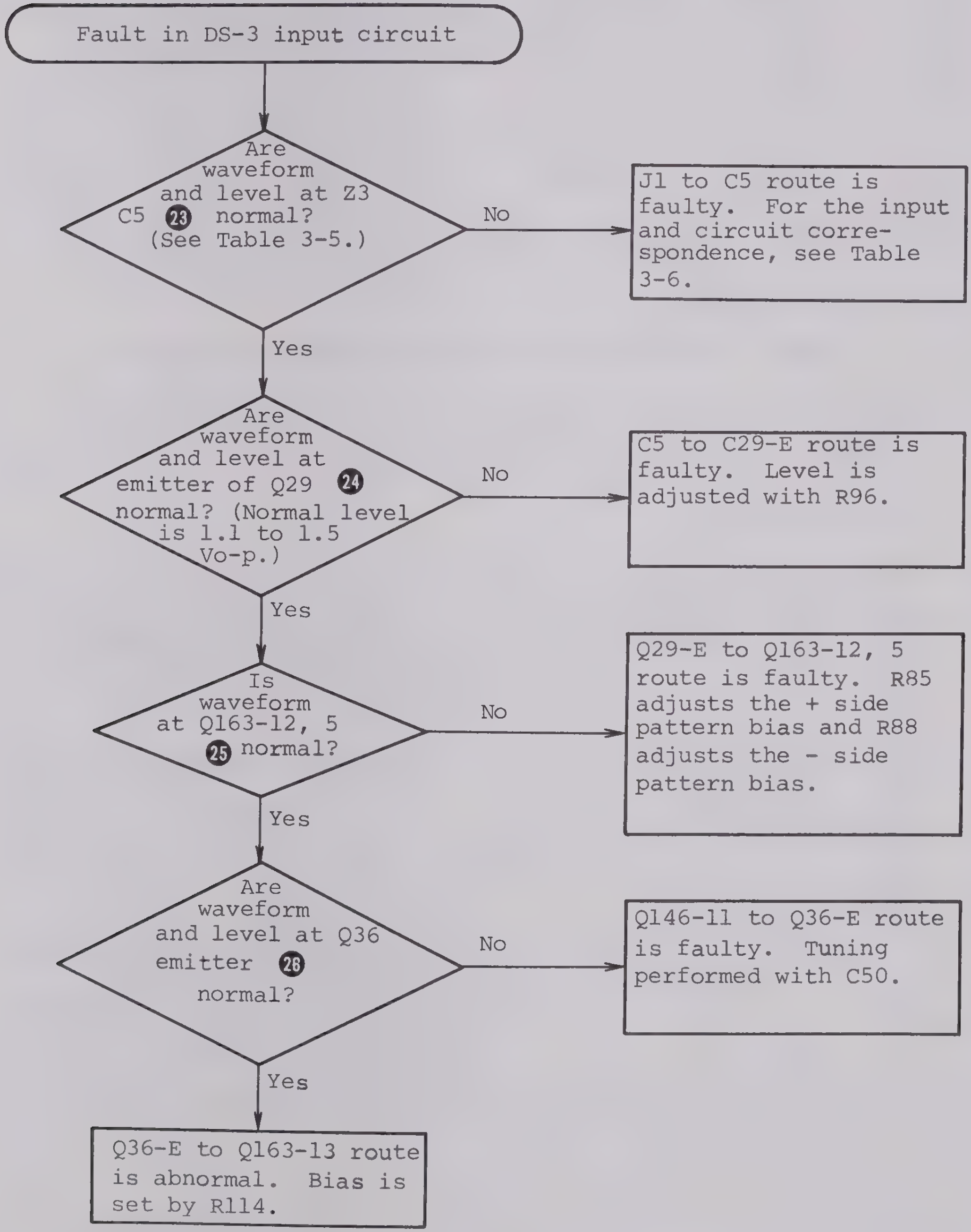

Fault in DS-3 input circuit
Are waveform and level at Z3 C5 ㉓ normal? (See Table 3-5.)
No
J1 to C5 route is faulty. For the input and circuit correspondence, see Table 3-6.
Yes
Are waveform and level at emitter of Q29 ㉔ normal? (Normal level is 1.1 to 1.5 Vo-p.)
No
C5 to C29-E route is faulty. Level is adjusted with R96.
Yes
Is waveform at Q163-12, 5 ㉕ normal?
No
Q29-E to Q163-12, 5 route is faulty. R85 adjusts the + side pattern bias and R88 adjusts the - side pattern bias.
Yes
Are waveform and level at Q36 emitter ㉖ normal?
No
Q146-11 to Q36-E route is faulty. Tuning performed with C50.
Yes
Q36-E to Q163-13 route is abnormal. Bias is set by R114.

Fig. 3-39 DS-3 Input Circuit Troubleshooting Flowchart

Table 3-5 Level at C5

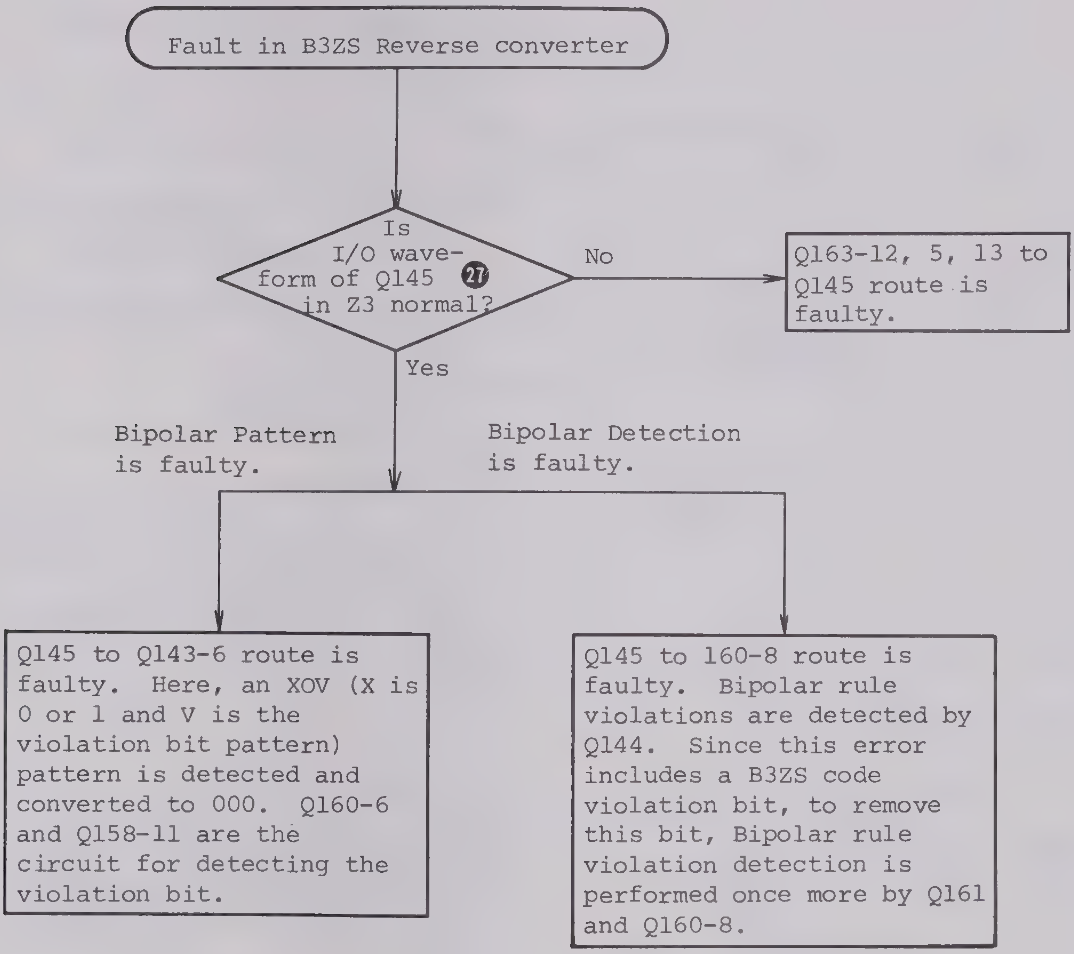
INPUT	Level at C5 (example)	Input level
HIGH	approx. 0.28 Vo-p	Transmitter HIGH
DSX-3	approx. 0.37 Vo-p	Transmitter DSX-3
LOW	approx. 0.45 Vo-p	Level of transmitter HIGH attenuated 20 dB.
DSX-3 LOW	approx. 0.48 Vo-p	Level of transmitter DSX-3 attenuated 20 dB.

Table 3-6 Input and Circuit Correspondence

INPUT	Circuit	Remarks
HIGH	Q1 to Q2 to Q3	
DSX-3	Q1 to Q5 to Q7 to Q4 Q64 to Q16 to Q11, 12, 13	$\sqrt{f}$ AGC circuit (Q5 to Q7) gain is adjusted with R48. (Example: In the example in Table 3-5, R3-7 is approximately -8 V (normally -6 to -10 V)).
LOW	Q1 to Q9 to Q10	
DSX-3 LOW	Q1 to Q5 to Q8 to Q10 R52 to Q11, Q12, Q13	$\sqrt{f}$ AGC circuit (Q5 to Q7) gain is adjusted with R52. In this case, cable equalizing is performed not at 450 ft, but at about 900 ft. (Example: In the example in Table 3-5, the R3-7 is approximately -2.7 V (normally -2.3 to -3 V)).

3.3.6 B3ZS Reverse Conversion Circuit Troubleshooting

Refer to 12 Bit Error Detector (Z3): 43W30648 (3/10)


Fault in B3ZS Reverse converter
Is I/O wave-form of Q145 ㉗ in Z3 normal?
No
Q163-12, 5, 13 to Q145 route is faulty.
Yes
Bipolar Pattern is faulty.
Bipolar Detection is faulty.

Q145 to Q143-6 route is faulty. Here, an XOV (X is 0 or 1 and V is the violation bit pattern) pattern is detected and converted to 000. Q160-6 and Q158-11 are the circuit for detecting the violation bit.

Q145 to 160-8 route is faulty. Bipolar rule violations are detected by Q144. Since this error includes a B3ZS code violation bit, to remove this bit, Bipolar rule violation detection is performed once more by Q161 and Q160-8.

Fig. 3-40 B3Z3 Reverse Conversion Circuit Troubleshooting Flowchart

3.3.7 Unipolar Input Circuit Troubleshooting

Refer to 12 Bit Error Detector (Z3): 43W30648 (4/10, 10/10)

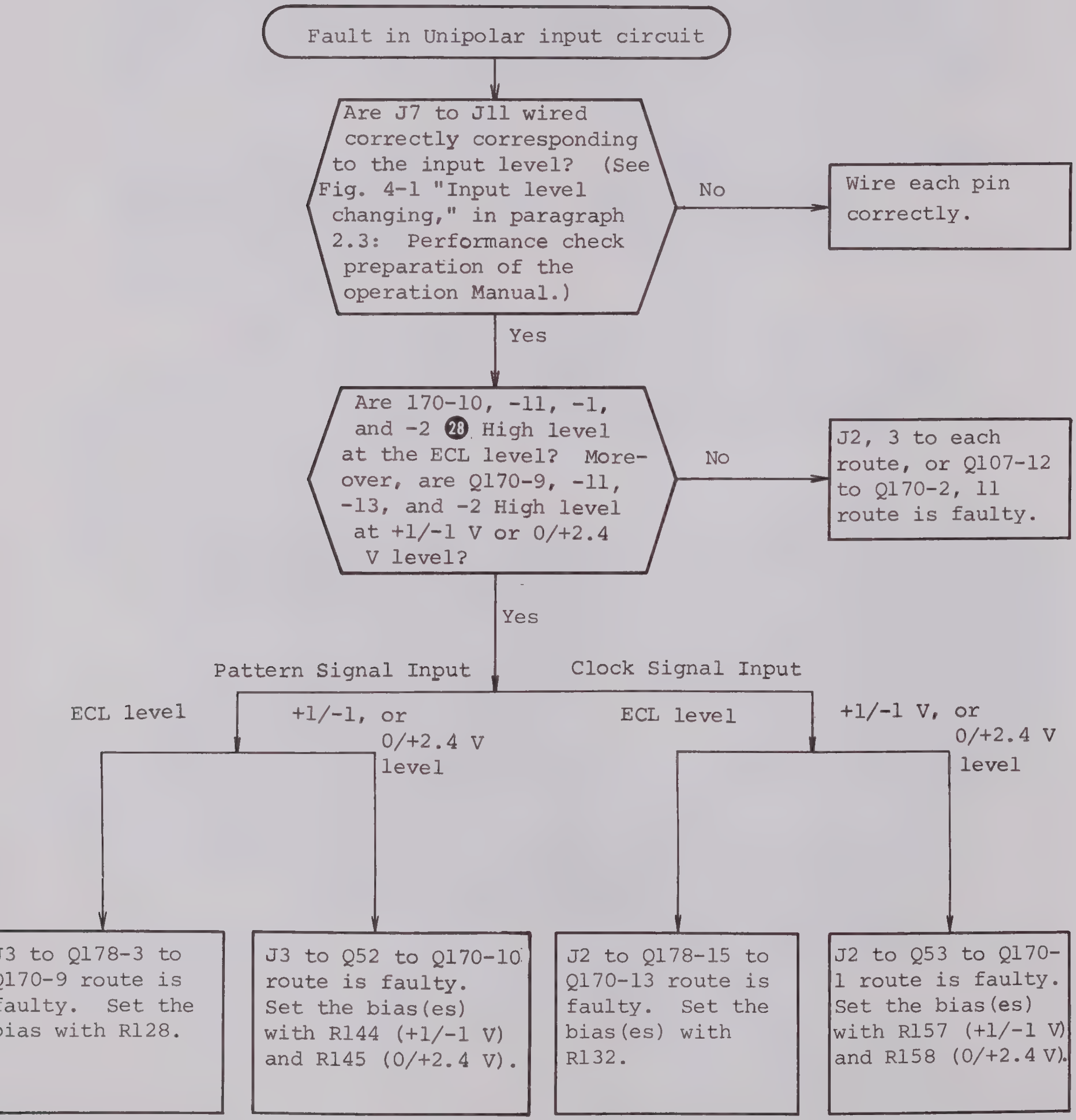

Fault in Unipolar input circuit
Are J7 to J11 wired correctly corresponding to the input level? (See Fig. 4-1 "Input level changing," in paragraph 2.3: Performance check preparation of the operation Manual.)
No
Wire each pin correctly.
Yes
Are 170-10, -11, -1, and -2 ㉘ High level at the ECL level? Moreover, are Q170-9, -11, -13, and -2 High level at +1/-1 V or 0/+2.4 V level?
No
J2, 3 to each route, or Q107-12 to Q170-2, 11 route is faulty.
Yes
Pattern Signal Input
Clock Signal Input
ECL level
+1/-1, or 0/+2.4 V level
ECL level
+1/-1 V, or 0/+2.4 V level
3 to Q178-3 to 170-9 route is aulty. Set the ias with R128.
J3 to Q52 to Q170-10 route is faulty. Set the bias(es) with R144 (+1/-1 V) and R145 (0/+2.4 V).
J2 to Q178-15 to Q170-13 route is faulty. Set the bias(es) with R132.
J2 to Q53 to Q170-1 route is faulty. Set the bias(es) with R157 (+1/-1 V) and R158 (0/+2.4 V).

Fig. 3-41 Unipolar Input Circuit Troubleshooting Flowchart

3.3.8 Framing Circuit Troubleshooting

Refer to 12 Bit Error Detector (Z3): 43W30648 (4/10, 5/10, 10/10)

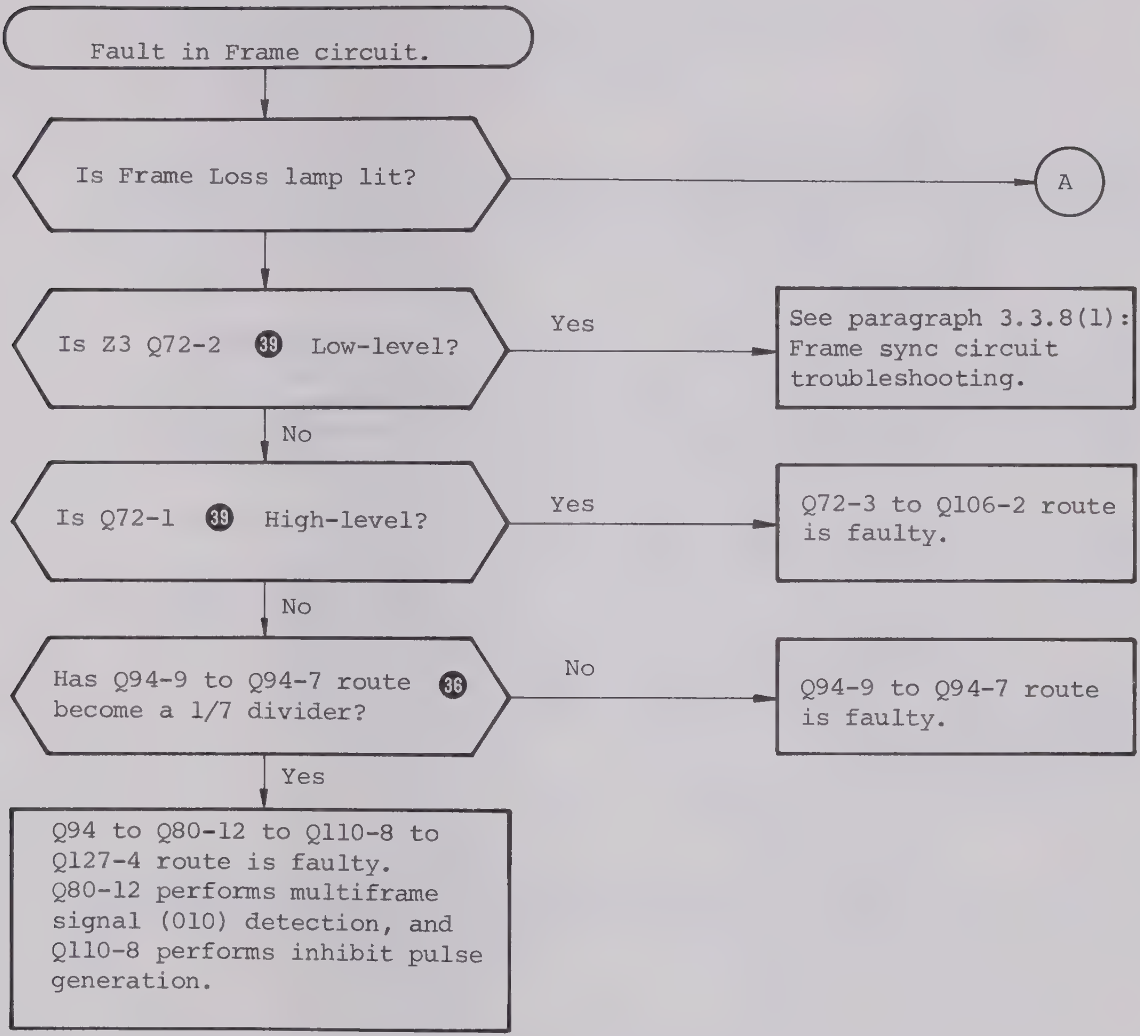

Fault in Frame circuit.
Is Frame Loss lamp lit?
A
Is Z3 Q72-2 (39) Low-level?
Yes
See paragraph 3.3.8(1): Frame sync circuit troubleshooting.
No
Is Q72-1 (39) High-level?
Yes
Q72-3 to Q106-2 route is faulty.
No
Has Q94-9 to Q94-7 route (36) become a 1/7 divider?
No
Q94-9 to Q94-7 route is faulty.
Yes
Q94 to Q80-12 to Q110-8 to Q127-4 route is faulty. Q80-12 performs multiframe signal (010) detection, and Q110-8 performs inhibit pulse generation.

Fig. 3-42 Framing Circuit Troubleshooting Flowchart

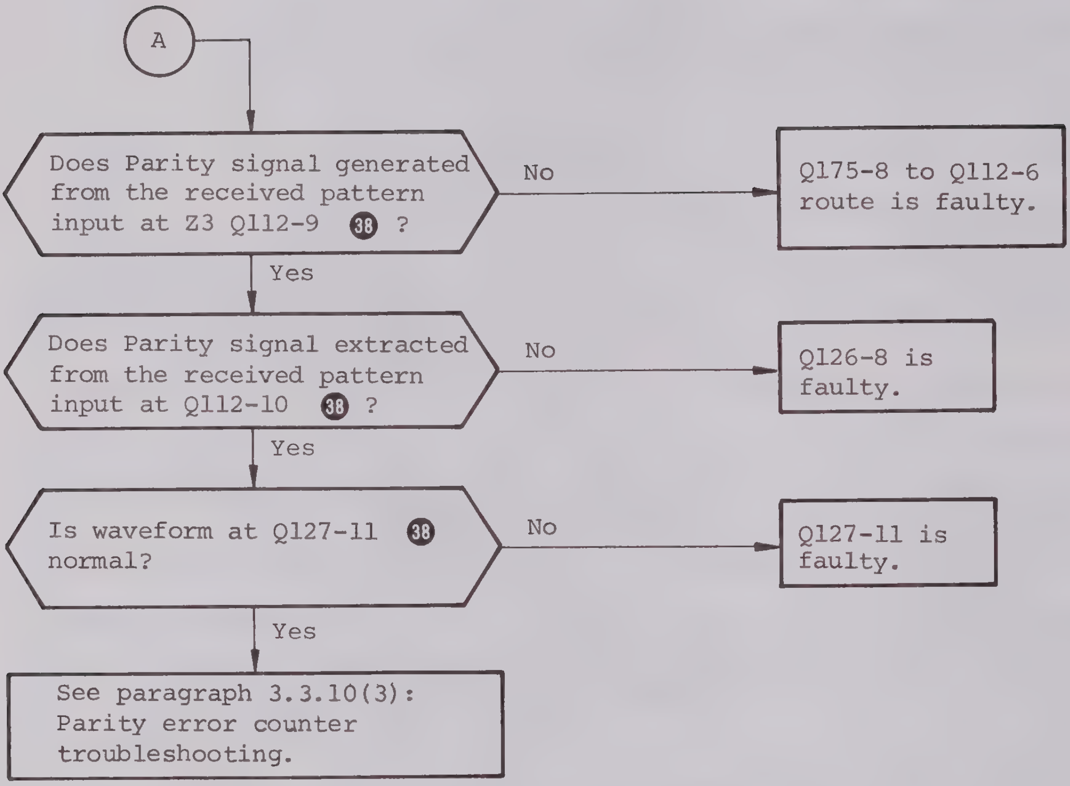
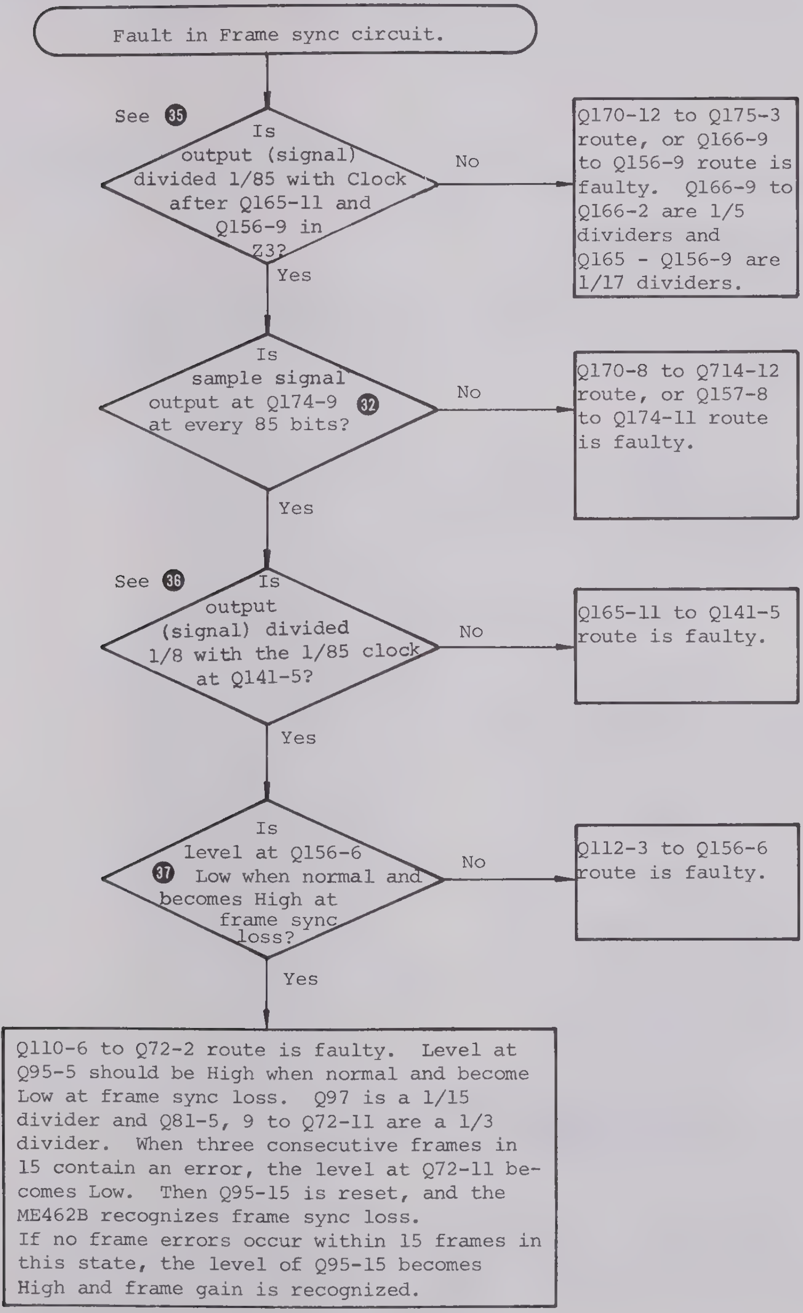

A
Does Parity signal generated from the received pattern input at Z3 Q112-9 ㊳ ?
No
Q175-8 to Q112-6 route is faulty.
Yes
Does Parity signal extracted from the received pattern input at Q112-10 ㊳ ?
No
Q126-8 is faulty.
Yes
Is waveform at Q127-11 ㊳ normal?
No
Q127-11 is faulty.
Yes
See paragraph 3.3.10(3): Parity error counter troubleshooting.

Fig. 3-42 (Cont.) Framing Circuit Troubleshooting Flowchart

3.3.8 (1) Frame Sync Circuit

Refer to 12 Bit Error Detector (Z3): 43W30648 (4/10, 5/10)



Fault in Frame sync circuit.

Is output (signal) divided 1/85 with Clock after Q165-11 and Q156-9 in Z3?

Q170-12 to Q175-3 route, or Q166-9 to Q156-9 route is faulty. Q166-9 to Q166-2 are 1/5 dividers and Q165 - Q156-9 are 1/17 dividers.

Is sample signal output at Q174-9 ㉜ at every 85 bits?

Q170-8 to Q714-12 route, or Q157-8 to Q174-11 route is faulty.

Is output (signal) divided 1/8 with the 1/85 clock at Q141-5?

Q165-11 to Q141-5 route is faulty.

Is level at Q156-6 Low when normal and becomes High at frame sync loss?

Q112-3 to Q156-6 route is faulty.

Q110-6 to Q72-2 route is faulty. Level at Q95-5 should be High when normal and become Low at frame sync loss. Q97 is a 1/15 divider and Q81-5, 9 to Q72-11 are a 1/3 divider. When three consecutive frames in 15 contain an error, the level at Q72-11 becomes Low. Then Q95-15 is reset, and the ME462B recognizes frame sync loss.
If no frame errors occur within 15 frames in this state, the level of Q95-15 becomes High and frame gain is recognized.

Fig. 3-43 Frame Sync Circuit Troubleshooting Flowchart

3.3.9 Error Detector Troubleshooting

Refer to
4 Power Supply Circuit (Z2): 43W30644 (3/5, 4/5)
12 Bit Error Detector (Z3): 43W30648 (4/10, 6/10, 7/10, 9/10, 10/10)

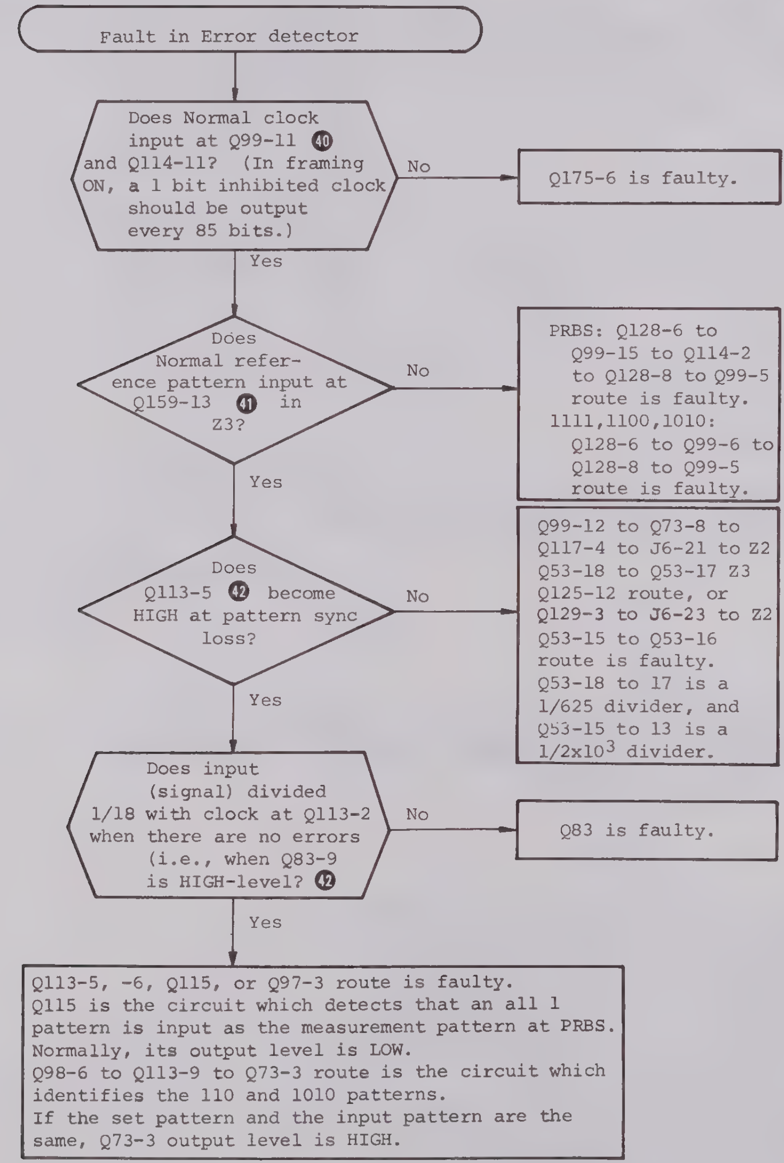

Fault in Error detector
Does Normal clock input at Q99-11 ㊵ and Q114-11? (In framing ON, a 1 bit inhibited clock should be output every 85 bits.)
No
Q175-6 is faulty.
Yes
Does Normal reference pattern input at Q159-13 ㊶ in Z3?
No
PRBS: Q128-6 to Q99-15 to Q114-2 to Q128-8 to Q99-5 route is faulty. 1111,1100,1010: Q128-6 to Q99-6 to Q128-8 to Q99-5 route is faulty.
Yes
Does Q113-5 ㊷ become HIGH at pattern sync loss?
No
Q99-12 to Q73-8 to Q117-4 to J6-21 to Z2 Q53-18 to Q53-17 Z3 Q125-12 route, or Q129-3 to J6-23 to Z2 Q53-15 to Q53-16 route is faulty. Q53-18 to 17 is a 1/625 divider, and Q53-15 to 13 is a 1/2x10³ divider.
Yes
Does input (signal) divided 1/18 with clock at Q113-2 when there are no errors (i.e., when Q83-9 is HIGH-level? ㊷
No
Q83 is faulty.
Yes
Q113-5, -6, Q115, or Q97-3 route is faulty. Q115 is the circuit which detects that an all 1 pattern is input as the measurement pattern at PRBS. Normally, its output level is LOW. Q98-6 to Q113-9 to Q73-3 route is the circuit which identifies the 110 and 1010 patterns. If the set pattern and the input pattern are the same, Q73-3 output level is HIGH.

Fig. 3-44 Error Detector Troubleshooting Flowchart

3.3.10 Counter Circuit Troubleshooting

(1) Bit Error Counter

Refer to
11 Control Circuit (Z2): 43W30649 (1/5, 4/5)
12 Bit Error Detector (Z3): 43W30648 (7/10, 10/10)

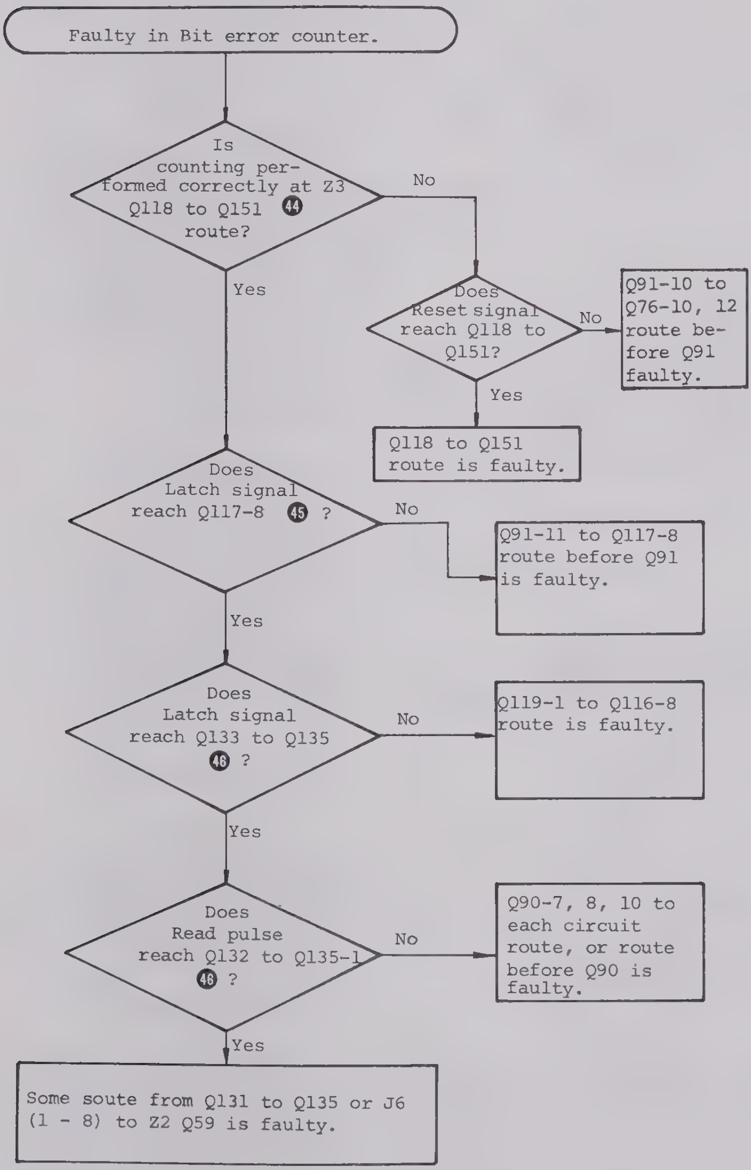

Faulty in Bit error counter.
Is counting performed correctly at Z3 Q118 to Q151 ㊹ route?
No
Yes
Does Reset signal reach Q118 to Q151?
No
Q91-10 to Q76-10, 12 route before Q91 faulty.
Yes
Q118 to Q151 route is faulty.
Does Latch signal reach Q117-8 ㊺ ?
No
Q91-11 to Q117-8 route before Q91 is faulty.
Yes
Does Latch signal reach Q133 to Q135 ㊻ ?
No
Q119-1 to Q116-8 route is faulty.
Yes
Does Read pulse reach Q132 to Q135-1 ㊻ ?
No
Q90-7, 8, 10 to each circuit route, or route before Q90 is faulty.
Yes
Some soute from Q131 to Q135 or J6 (1 - 8) to Z2 Q59 is faulty.

Fig. 3-45 Counter Circuit Troubleshooting Flowchart

(2) Bipolar Violation Counter

Refer to
- 11 Control Circuit (Z2): 43W30649 (1/5, 4/5)
- 12 Bit Error Detector (Z3): 43W30648 (8/10, 10/10)

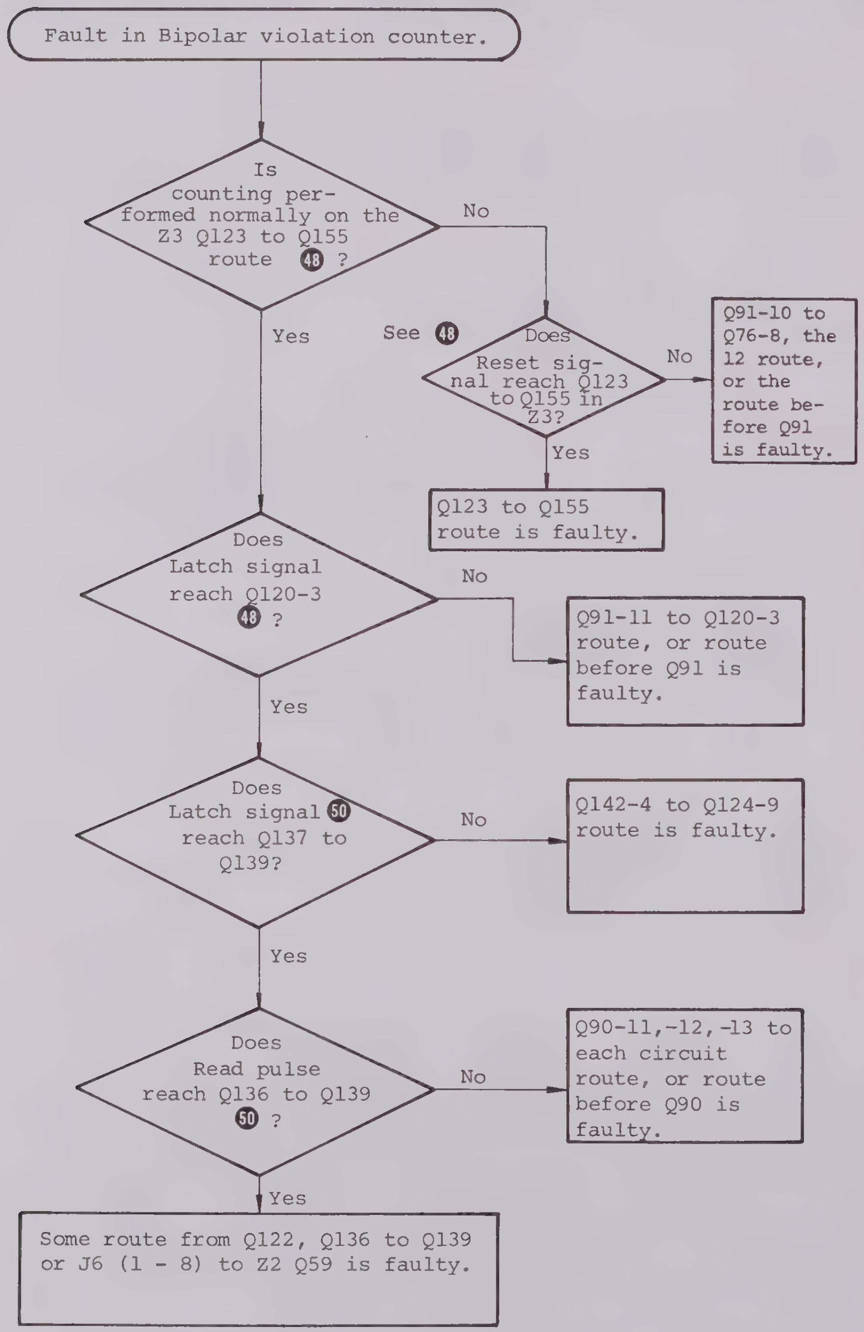

Fault in Bipolar violation counter.
Is counting performed normally on the Z3 Q123 to Q155 route ㊽ ?
No
Yes
See ㊽
Does Reset signal reach Q123 to Q155 in Z3?
No
Q91-10 to Q76-8, the 12 route, or the route before Q91 is faulty.
Yes
Q123 to Q155 route is faulty.
Does Latch signal reach Q120-3 ㊽ ?
No
Q91-11 to Q120-3 route, or route before Q91 is faulty.
Yes
Does Latch signal ㊿ reach Q137 to Q139?
No
Q142-4 to Q124-9 route is faulty.
Yes
Does Read pulse reach Q136 to Q139 ㊿ ?
No
Q90-11,-12,-13 to each circuit route, or route before Q90 is faulty.
Yes
Some route from Q122, Q136 to Q139 or J6 (1 - 8) to Z2 Q59 is faulty.

Fig. 3-46 Bipolar Violation Counter Troubleshooting Flowchart

(3) Parity Error Counter

Refer to
11 Control Circuit (Z2): 43W30649 (1/5, 4/5)
12 Bit Error Detector (Z3): 43W30648 (9/10, 10/10)

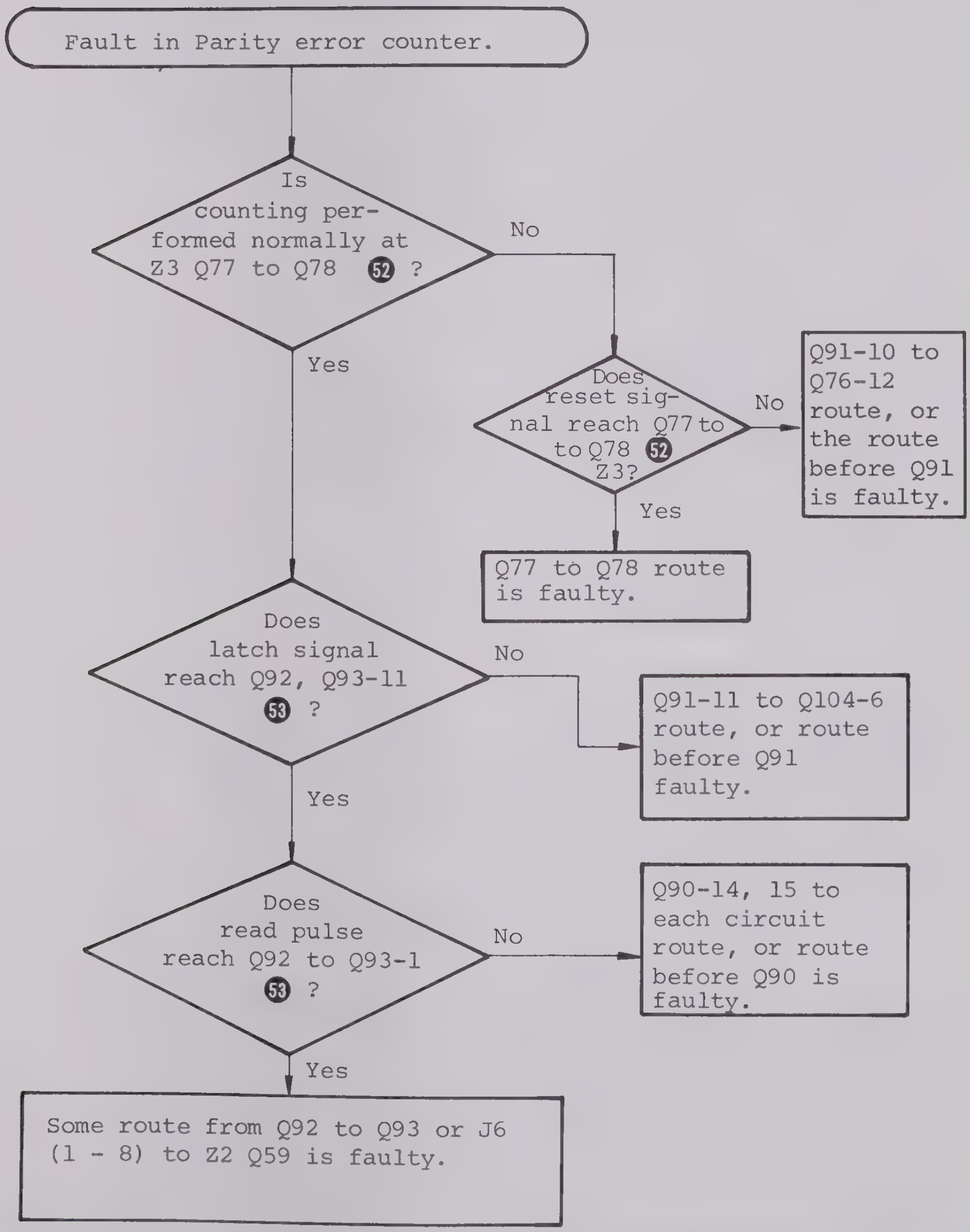
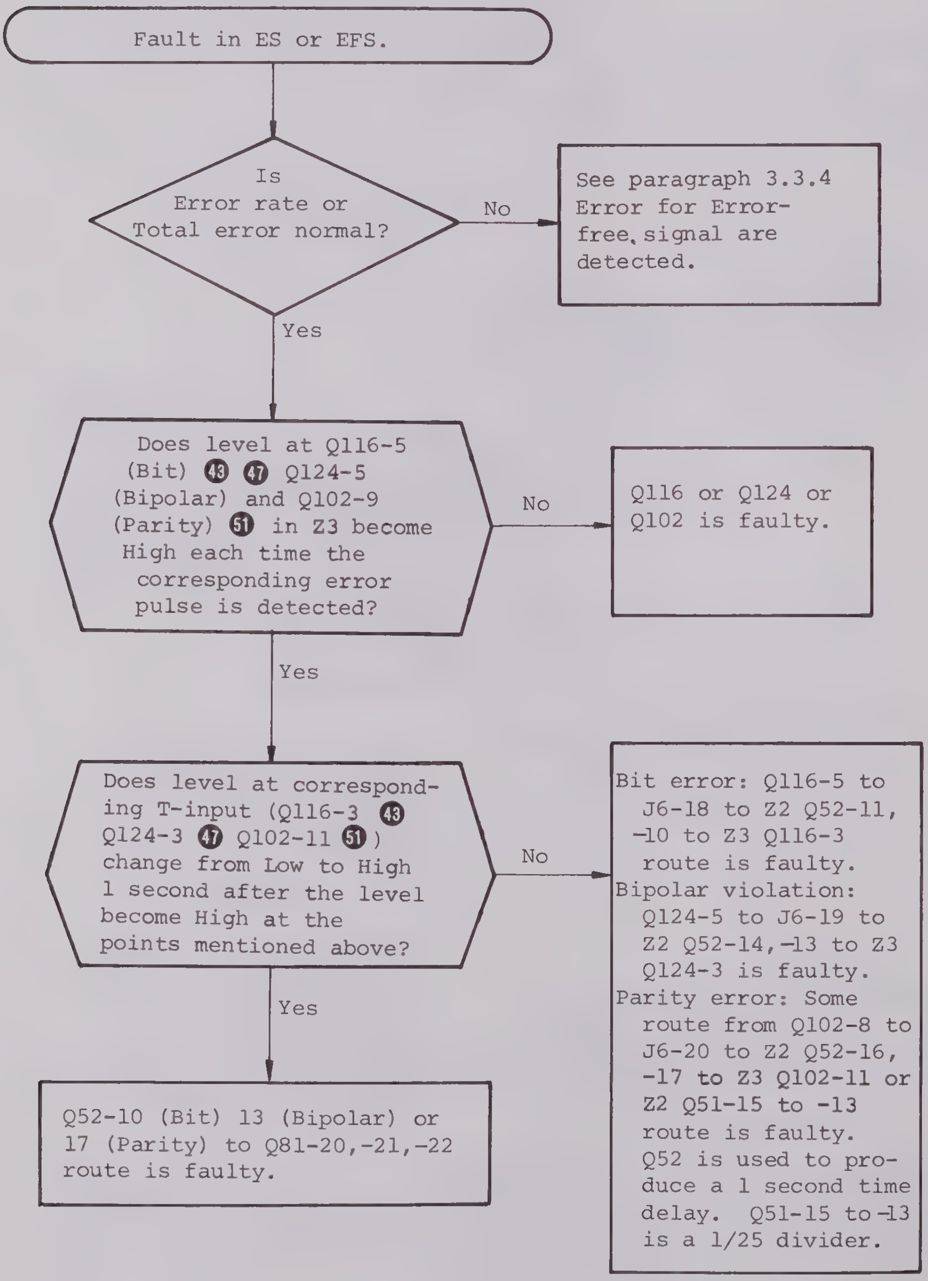

Fault in Parity error counter.
Is counting performed normally at Z3 Q77 to Q78 (52) ?
No
Yes
Does reset signal reach Q77 to to Q78 (52) Z3?
No
Q91-10 to Q76-12 route, or the route before Q91 is faulty.
Yes
Q77 to Q78 route is faulty.
Does latch signal reach Q92, Q93-11 (53) ?
No
Q91-11 to Q104-6 route, or route before Q91 faulty.
Yes
Does read pulse reach Q92 to Q93-1 (53) ?
No
Q90-14, 15 to each circuit route, or route before Q90 is faulty.
Yes
Some route from Q92 to Q93 or J6 (1 - 8) to Z2 Q59 is faulty.

Fig. 3-47 Parity Error Counter Troubleshooting Flowchart

3.3.11 Error Seconds (ES) or Error Free Seconds (EFS) Circuit Troubleshooting

Refer to
11 Control Circuit (Z2): 43W30749 (1/5, 3/5, 5/5)
12 Bit Error Detector (Z3): 43W30848 (7/10 to 10/10)



Fault in ES or EFS.

Is Error rate or Total error normal?

See paragraph 3.3.4 Error for Error-free, signal are detected.

Does level at Q116-5 (Bit) (43) (47) Q124-5 (Bipolar) and Q102-9 (Parity) (51) in Z3 become High each time the corresponding error pulse is detected?

Q116 or Q124 or Q102 is faulty.

Does level at corresponding T-input (Q116-3 (43) Q124-3 (47) Q102-11 (51)) change from Low to High 1 second after the level become High at the points mentioned above?

Bit error: Q116-5 to J6-18 to Z2 Q52-11, -10 to Z3 Q116-3 route is faulty.
Bipolar violation: Q124-5 to J6-19 to Z2 Q52-14, -13 to Z3 Q124-3 is faulty.
Parity error: Some route from Q102-8 to J6-20 to Z2 Q52-16, -17 to Z3 Q102-11 or Z2 Q51-15 to -13 route is faulty.
Q52 is used to produce a 1 second time delay. Q51-15 to -13 is a 1/25 divider.

Q52-10 (Bit) 13 (Bipolar) or 17 (Parity) to Q81-20,-21,-22 route is faulty.

Fig. 3-48 Error Second (ES) or Error Free Second (EFS) Troubleshooting Flowchart

3.3.12 Alarm Display or Buzzer Sound Circuit Troubleshooting

When the circuit is normal at the lamps below, check the associated LED or its peripheral circuit.

(1) AC POWER FAILURE Lamp

Refer to
10 Overall Circuit of Receiver: 43W30647 (1/1)
11 Control Circuit (Z2) : 43W30649 (1/5, 5/5)

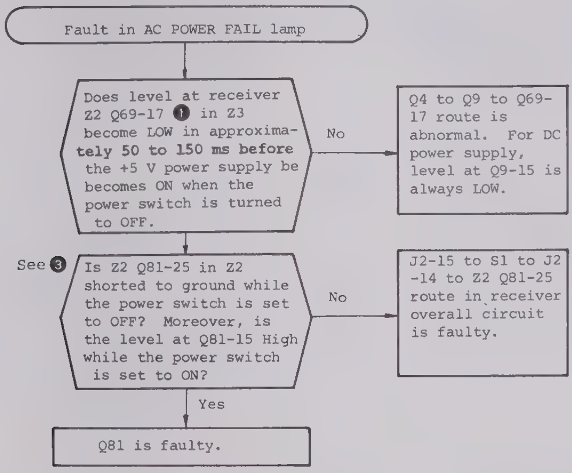

Fault in AC POWER FAIL lamp
Does level at receiver Z2 Q69-17 ❶ in Z3 become LOW in approximately 50 to 150 ms before the +5 V power supply be becomes ON when the power switch is turned to OFF.
No
Q4 to Q9 to Q69-17 route is abnormal. For DC power supply, level at Q9-15 is always LOW.
See ❸
Is Z2 Q81-25 in Z2 shorted to ground while the power switch is set to OFF? Moreover, is the level at Q81-15 High while the power switch is set to ON?
No
J2-15 to S1 to J2-14 to Z2 Q81-25 route in receiver overall circuit is faulty.
Yes
Q81 is faulty.

Fig. 3-49 Alarm Display (AC POWER FAILURE Lamp) Troubleshooting Flowchart

(2) SIGNAL LOSS Lamp

Refer to 12 Bit Error Detector (Z3): 43W30648 (4/10, 10/10)

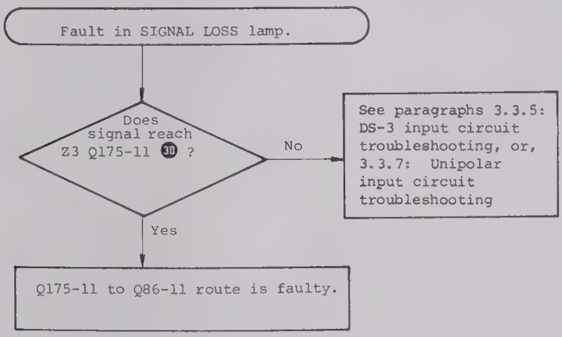

Fault in SIGNAL LOSS lamp.
Does signal reach Z3 Q175-11 ㉚ ?
No
See paragraphs 3.3.5: DS-3 input circuit troubleshooting, or, 3.3.7: Unipolar input circuit troubleshooting
Yes
Q175-11 to Q86-11 route is faulty.

Fig. 3-50 Alarm Display (SIGNAL LOSS Lamp) Troubleshooting Flowchart

(3) FRAME LOSS Lamp

Refer to 12 Bit Error Detector (Z3): 43W30648 (5/10, 10/10)

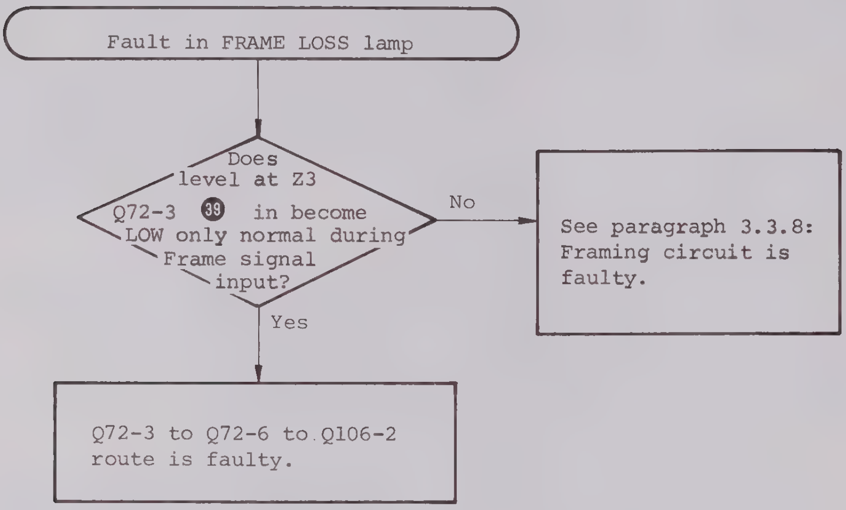

Fault in FRAME LOSS lamp
Does level at Z3 Q72-3 ㊴ in become LOW only normal during Frame signal input?
No
See paragraph 3.3.8: Framing circuit is faulty.
Yes
Q72-3 to Q72-6 to Q106-2 route is faulty.

Fig. 3-51 Alarm Display (FRAME LOSS Lamp) Troubleshooting Flowchart

(4) PATTERN SYNC LOSS Lamp

Refer to 12 Bit Error Detector (Z3): 43W30648 (6/10, 10/10)

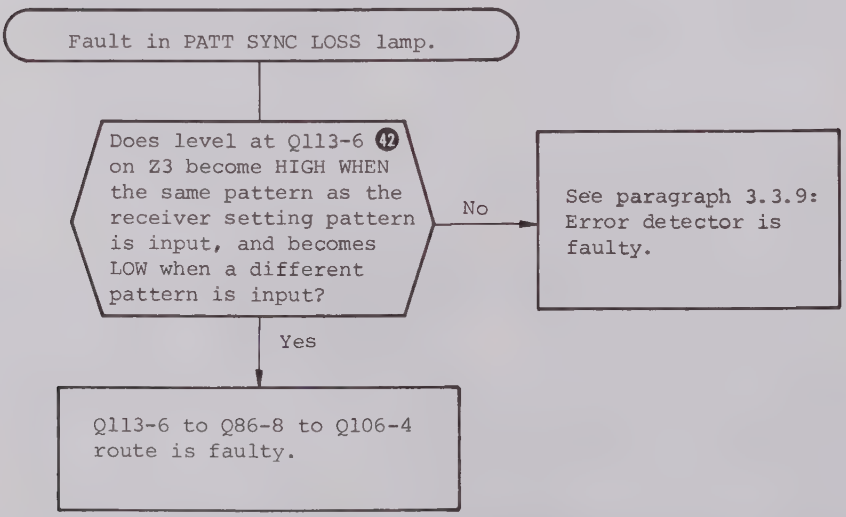

Fault in PATT SYNC LOSS lamp.
Does level at Q113-6 ㊷ on Z3 become HIGH WHEN the same pattern as the receiver setting pattern is input, and becomes LOW when a different pattern is input?
No
See paragraph 3.3.9: Error detector is faulty.
Yes
Q113-6 to Q86-8 to Q106-4 route is faulty.

Fig. 3-52 Alarm Display (PATTERN SYNC LOSS) Troubleshooting Flowchart

(5) BLUE SIGNAL Lamp

Refer to 12 Bit Error Detector (Z3): 43W30648 (4/10, 10/10)

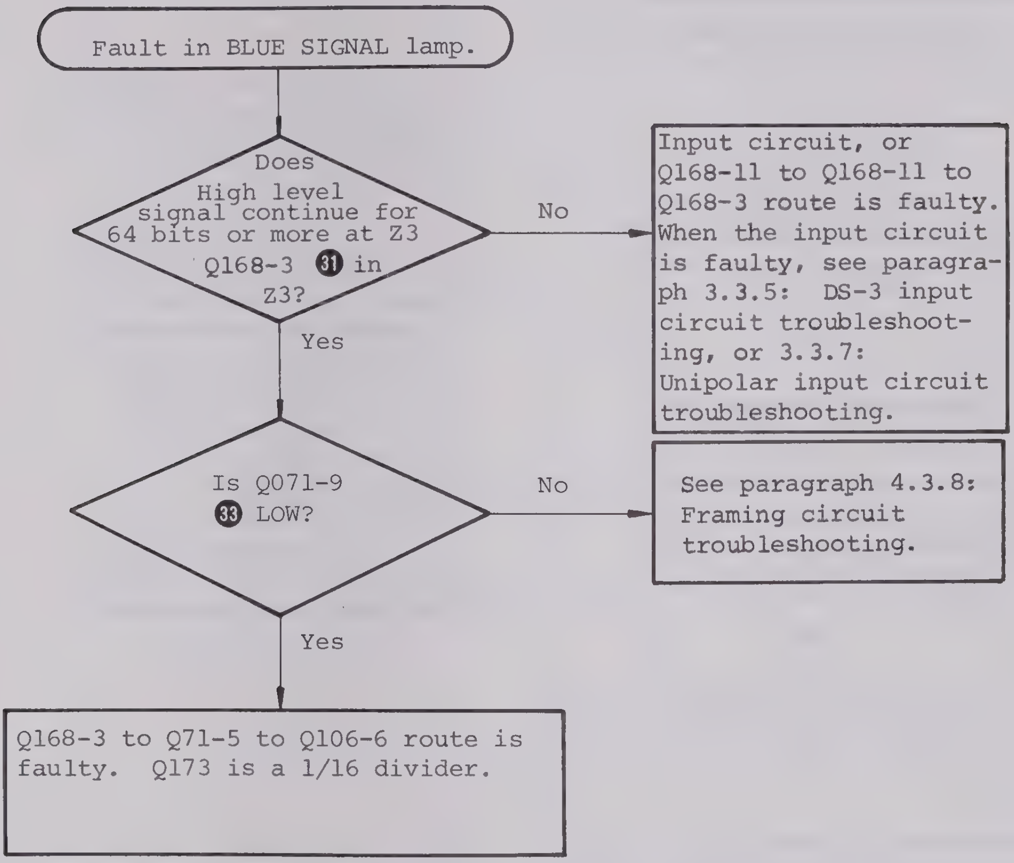
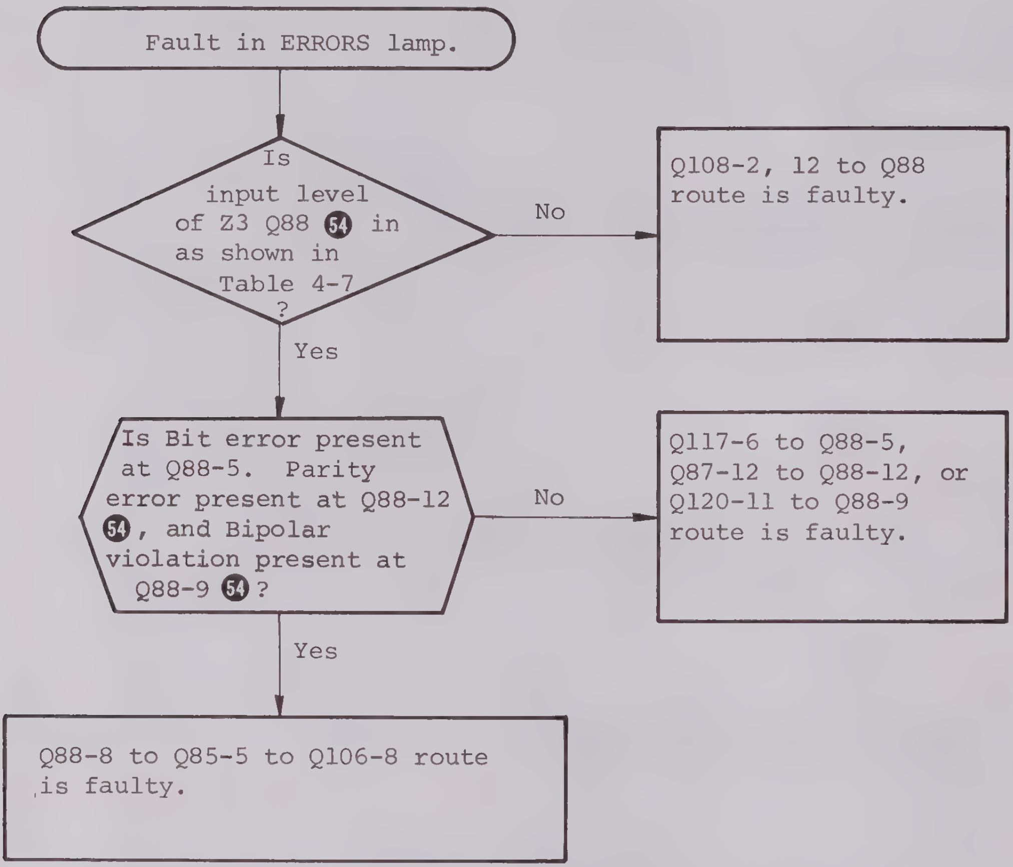

Fault in BLUE SIGNAL lamp.
Does High level signal continue for 64 bits or more at Z3 Q168-3 ㉛ in Z3?
No
Input circuit, or Q168-11 to Q168-11 to Q168-3 route is faulty. When the input circuit is faulty, see paragraph 3.3.5: DS-3 input circuit troubleshooting, or 3.3.7: Unipolar input circuit troubleshooting.
Yes
Is Q071-9 ㉝ LOW?
No
See paragraph 4.3.8: Framing circuit troubleshooting.
Yes
Q168-3 to Q71-5 to Q106-6 route is faulty. Q173 is a 1/16 divider.

Fig. 3-53 Alarm Display (BLUE SIGNAL Lamp) Troubleshooting Flowchart

(6) Error Lamp

Refer to $\boxed{12}$ Bit Error Detector (Z3): 43W30648 (7/10, 10/10)



Fault in ERRORS lamp.
Is input level of Z3 Q88 (54) in as shown in Table 4-7 ?
No
Q108-2, 12 to Q88 route is faulty.
Yes
Is Bit error present at Q88-5. Parity error present at Q88-12 (54), and Bipolar violation present at Q88-9 (54) ?
No
Q117-6 to Q88-5, Q87-12 to Q88-12, or Q120-11 to Q88-9 route is faulty.
Yes
Q88-8 to Q85-5 to Q106-8 route is faulty.

Fig. 3-54 Alarm Display (ERROR Lamp Blinking) Troubleshooting Flowchart

Table 3-7 Q88 Input Level

Pin Number	Error Setting		
	BIT	PARITY	BIPOLAR V
Q88 - 6	High	Low	High
Q88 - 4	High	High	Low
Q88 - 10	Low	Low	High
Q88 - 1	Low	High	Low
Q88 - 11	High	High	Low

(7) Buzzer

Refer to 12 Bit Error Detector (Z3): 43W30648 (9/10, 10/10)

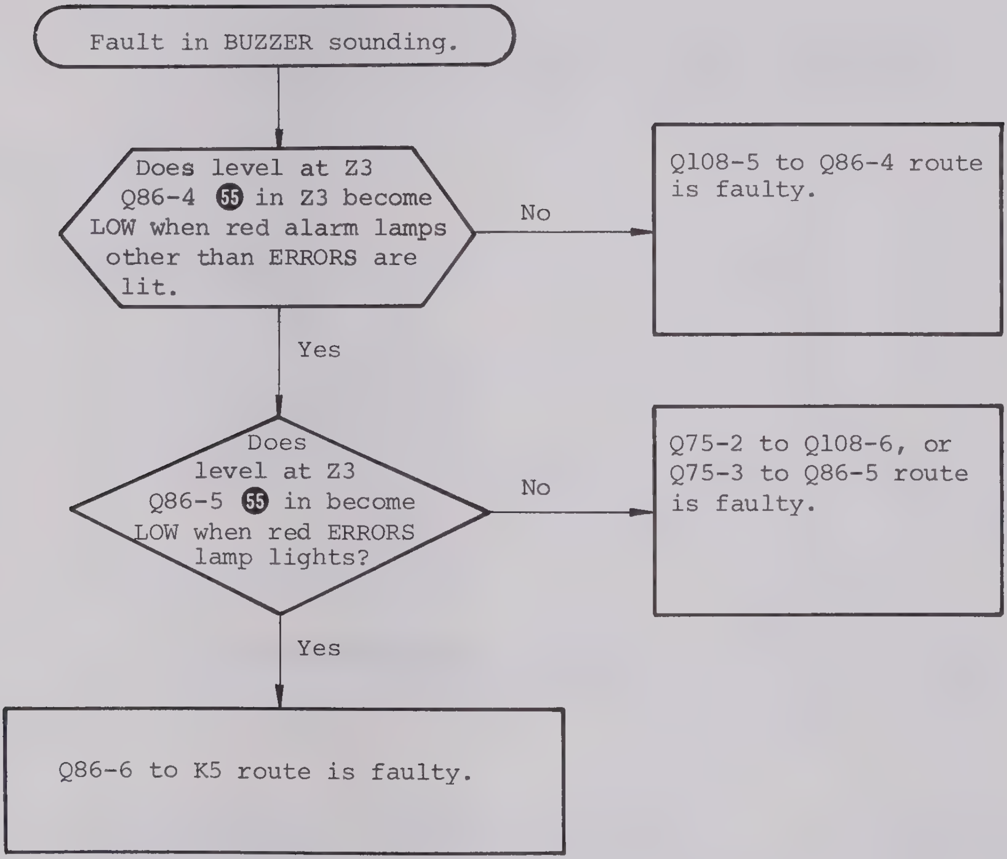

Fault in BUZZER sounding.
Does level at Z3 Q86-4 (55) in Z3 become LOW when red alarm lamps other than ERRORS are lit.
No
Q108-5 to Q86-4 route is faulty.
Yes
Does level at Z3 Q86-5 (55) in become LOW when red ERRORS lamp lights?
No
Q75-2 to Q108-6, or Q75-3 to Q86-5 route is faulty.
Yes
Q86-6 to K5 route is faulty.

Fig. 3-55 Buzzer Sound Troubleshooting Flowchart

3.3.13 Measuring Time or Real-Time Circuit Troubleshooting

Refer to
11 Control Circuit (Z2): 43W30649 (2/5, 3/5)
12 Bit Error Detector (Z3): 43W30648 (9/10, 10/10)

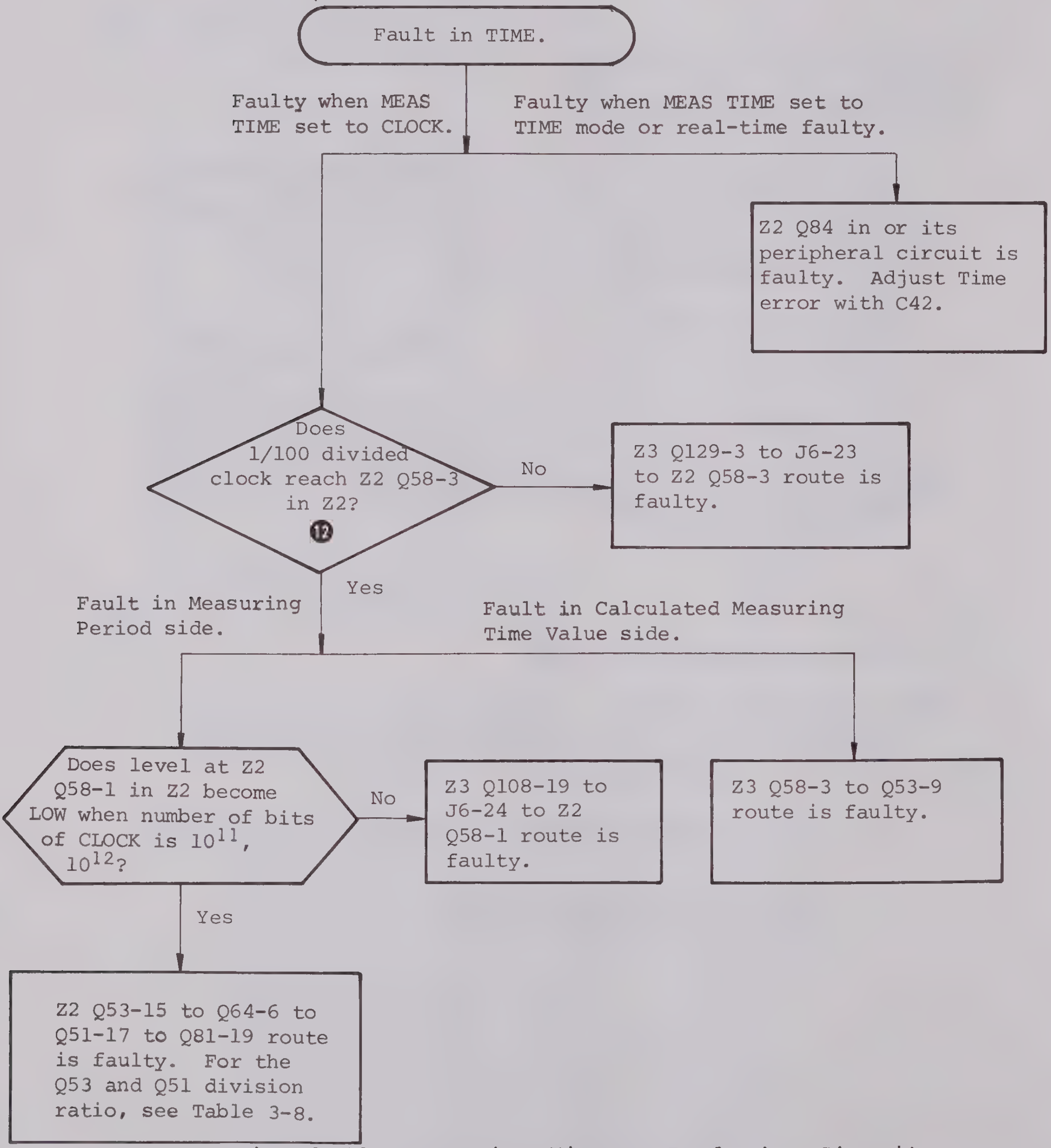

Fault in TIME.
Faulty when MEAS TIME set to CLOCK.
Faulty when MEAS TIME set to TIME mode or real-time faulty.
Z2 Q84 in or its peripheral circuit is faulty. Adjust Time error with C42.
Does 1/100 divided clock reach Z2 Q58-3 in Z2?
⑫
No
Z3 Q129-3 to J6-23 to Z2 Q58-3 route is faulty.
Yes
Fault in Measuring Period side.
Fault in Calculated Measuring Time Value side.
Does level at Z2 Q58-1 in Z2 become LOW when number of bits of CLOCK is 10^11, 10^12?
No
Z3 Q108-19 to J6-24 to Z2 Q58-1 route is faulty.
Z3 Q58-3 to Q53-9 route is faulty.
Yes
Z2 Q53-15 to Q64-6 to Q51-17 to Q81-19 route is faulty. For the Q53 and Q51 division ratio, see Table 3-8.

Fig. 3-56 Measuring Time or Real-time Circuit Troubleshooting Flowchart

Table 3-8 Division Ratio

Number of bits of clock	Between Q53-15 to -13	Between Q51-18 to -17
10^7	2000	50
10^8	2000	500
10^9	2000	5000
10^{10}	2000	50000
10^{11}	2000	5000
10^{12}	2000	50000

3.3.14 OUTPUT (CLOCK SYNC, MULTIFRAME SYNC, X-BIT, ERROR) Circuit Troubleshooting

Refer to
- 10 Overall Circuit of Receiver: 43W30647 (1/1)
- 12 Bit Error Detector (Z3) : 43W30648 (3/10 to 6/10, 9/10)

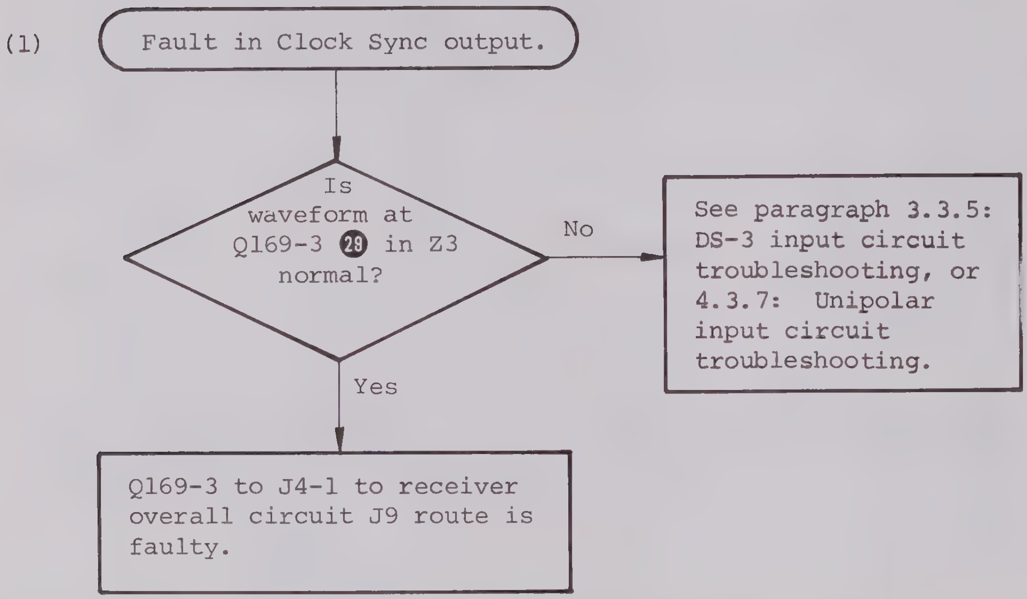

(1)
Fault in Clock Sync output.
Is waveform at Q169-3 ㉙ in Z3 normal?
No
See paragraph 3.3.5: DS-3 input circuit troubleshooting, or 4.3.7: Unipolar input circuit troubleshooting.
Yes
Q169-3 to J4-1 to receiver overall circuit J9 route is faulty.

Fig. 3-57 Clock Sync Output Circuit Troubleshooting Flowchart

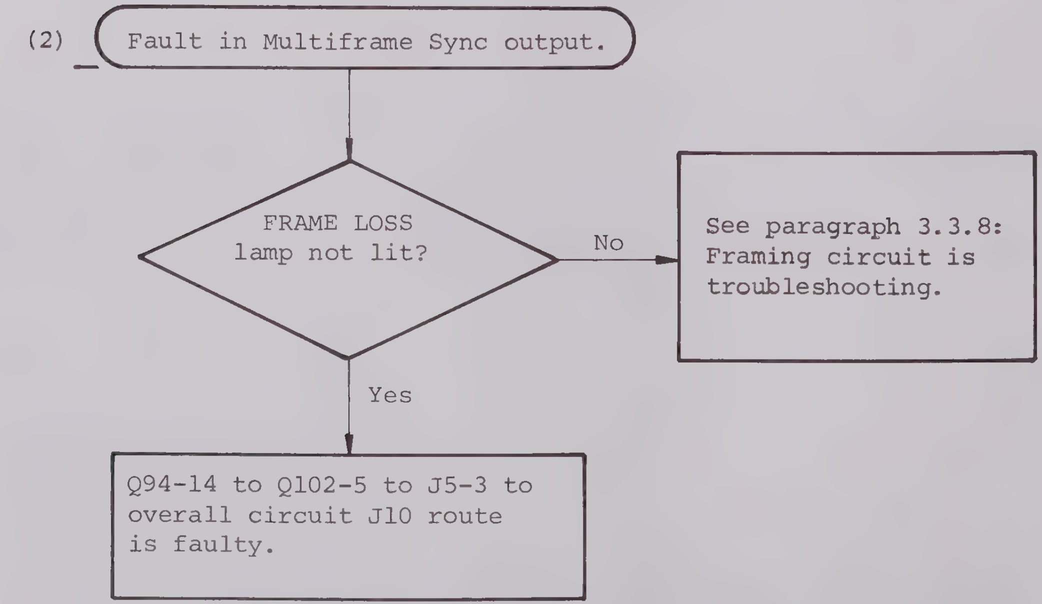

(2)
Fault in Multiframe Sync output.
FRAME LOSS lamp not lit?
No
See paragraph 3.3.8: Framing circuit is troubleshooting.
Yes
Q94-14 to Q102-5 to J5-3 to overall circuit J10 route is faulty.

Fig. 3-58 Multiframe Sync Output Circuit Troubleshooting Flowchart

(3)

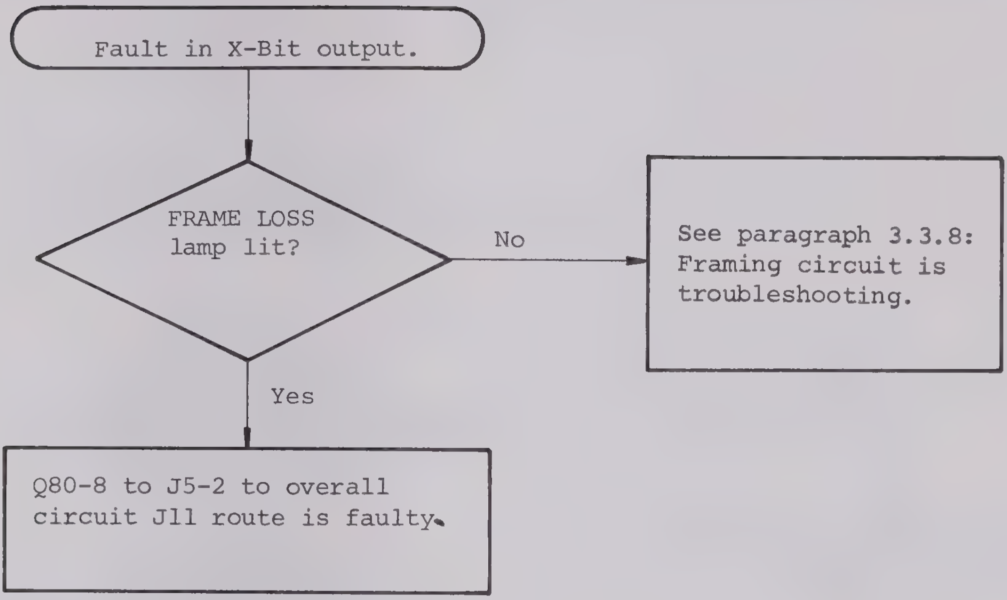

Fault in X-Bit output.
FRAME LOSS lamp lit?
No
See paragraph 3.3.8: Framing circuit is troubleshooting.
Yes
Q80-8 to J5-2 to overall circuit J11 route is faulty.

Fig. 3-59 X-Bit Output Circuit Troubleshooting Flowchart

(4)

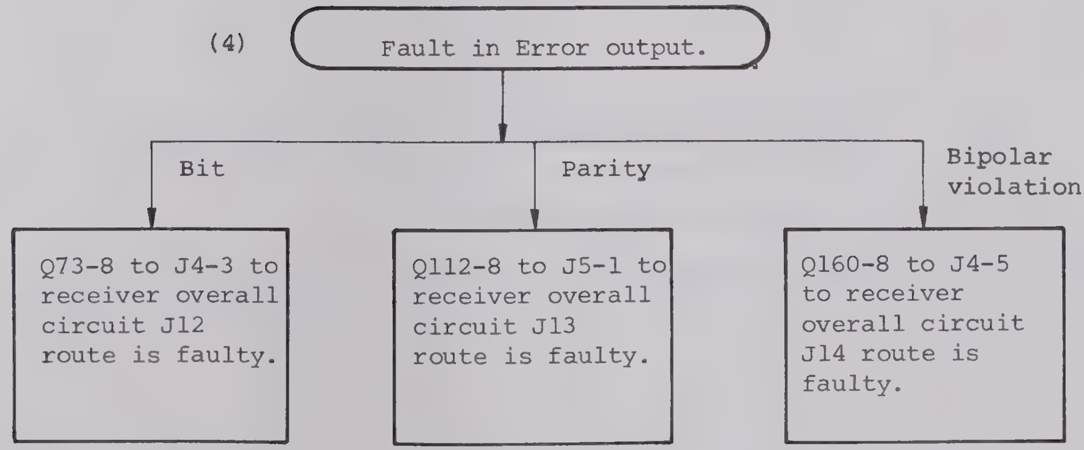
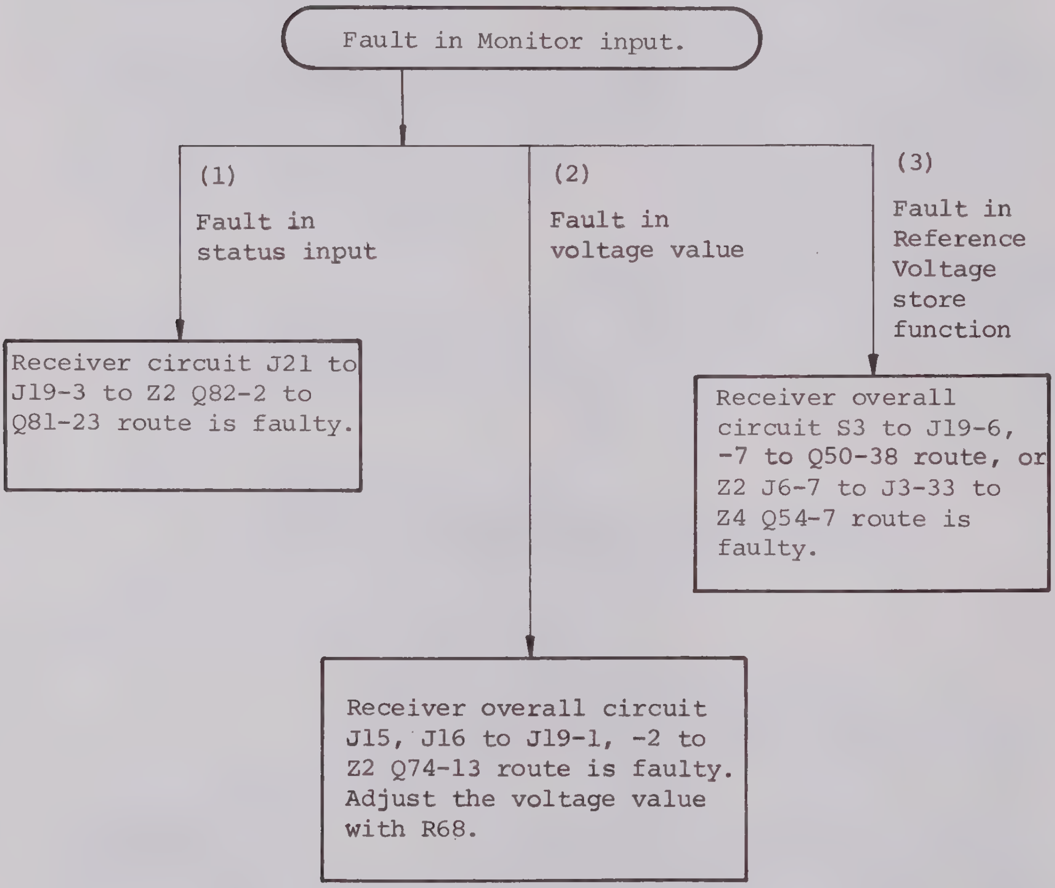

Fault in Error output.
Bit
Parity
Bipolar violation
Q73-8 to J4-3 to receiver overall circuit J12 route is faulty.
Q112-8 to J5-1 to receiver overall circuit J13 route is faulty.
Q160-8 to J4-5 to receiver overall circuit J14 route is faulty.

Fig. 3-60 X-Bit, Error Output Circuit Troubleshooting Flowchart

3.3.15 Monitor Input Circuit Troubleshooting

Refer to
- 10 Overall Circuit of Receiver: 43W30647 (1/1)
- 11 Control Circuit (Z2) : 43W30649 (1/5 to 4/5)
- 13 Front Panel Circuit (Z4) : 43W30650 (1/3)



Fault in Monitor input.
(1)
Fault in status input
(2)
Fault in voltage value
(3)
Fault in Reference Voltage store function
Receiver circuit J21 to J19-3 to Z2 Q82-2 to Q81-23 route is faulty.
Receiver overall circuit S3 to J19-6, -7 to Q50-38 route, or Z2 J6-7 to J3-33 to Z4 Q54-7 route is faulty.
Receiver overall circuit J15, J16 to J19-1, -2 to Z2 Q74-13 route is faulty. Adjust the voltage value with R68.

Fig. 3-61 Monitor Input Circuit Troubleshooting Flowchart

3.3.16 Function Switch Troubleshooting

Refer to
- 10 Overall Circuit of Receiver: 43W30647 (1/1)
- 12 Bit Error Detector (Z3) : 43W30648 (10/10)

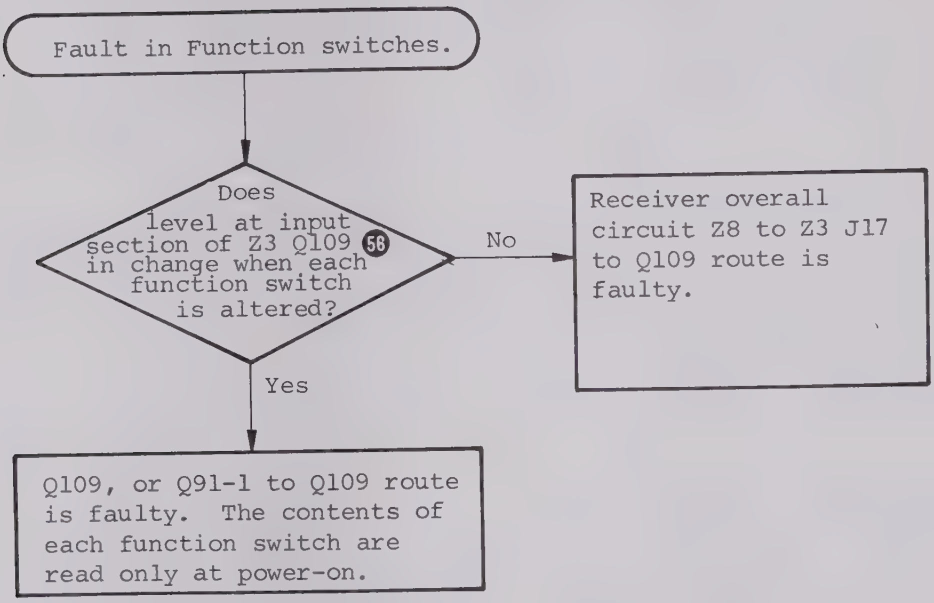
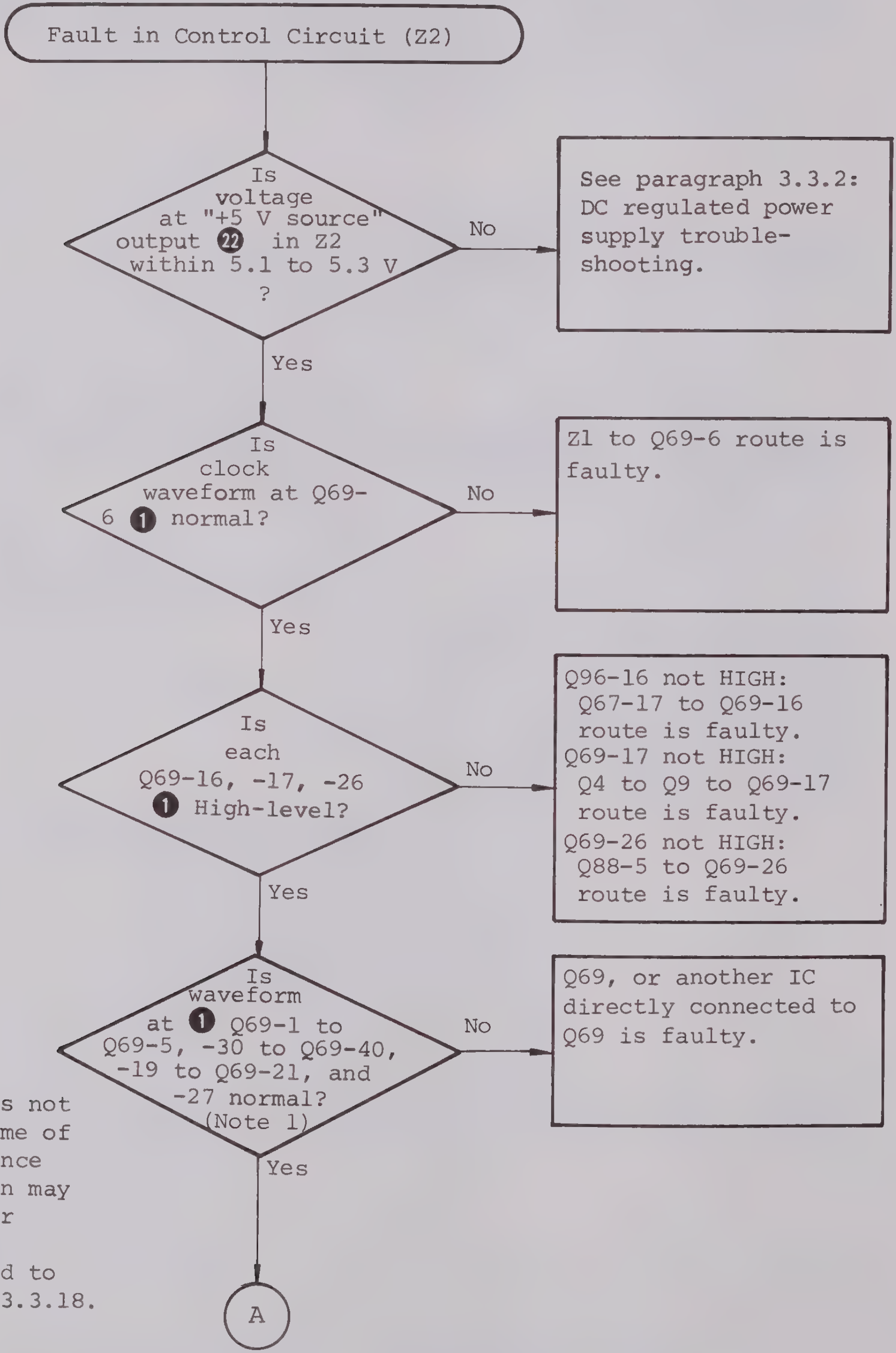

Fault in Function switches.
Does level at input section of Z3 Q109 (58) in change when each function switch is altered?
No
Receiver overall circuit Z8 to Z3 J17 to Q109 route is faulty.
Yes
Q109, or Q91-1 to Q109 route is faulty. The contents of each function switch are read only at power-on.

Fig. 3-62 Function Switch Troubleshooting Flowchart

3.3.17 Control Circuit Troubleshooting

Refer to $\boxed{11}$ Control Circuit (Z2): 43W30649 (1/5 to 5/5)


Fault in Control Circuit (Z2)
Is voltage at "+5 V source" output ㉒ in Z2 within 5.1 to 5.3 V ?
No
See paragraph 3.3.2: DC regulated power supply trouble-shooting.
Yes
Is clock waveform at Q69-6 ❶ normal?
No
Z1 to Q69-6 route is faulty.
Yes
Is each Q69-16, -17, -26 ❶ High-level?
No
Q96-16 not HIGH: Q67-17 to Q69-16 route is faulty.
Q69-17 not HIGH: Q4 to Q9 to Q69-17 route is faulty.
Q69-26 not HIGH: Q88-5 to Q69-26 route is faulty.
Yes
Is waveform at ❶ Q69-1 to Q69-5, -30 to Q69-40, -19 to Q69-21, and -27 normal? (Note 1)
No
Q69, or another IC directly connected to Q69 is faulty.
Yes
A

Note 1:

When a pulse is not output from some of these pins, since this phenomenon may caused by other circuits being faulty, proceed to the next flow 3.3.18.

Fig. 3-63 Control Circuit Troubleshooting Flowchart

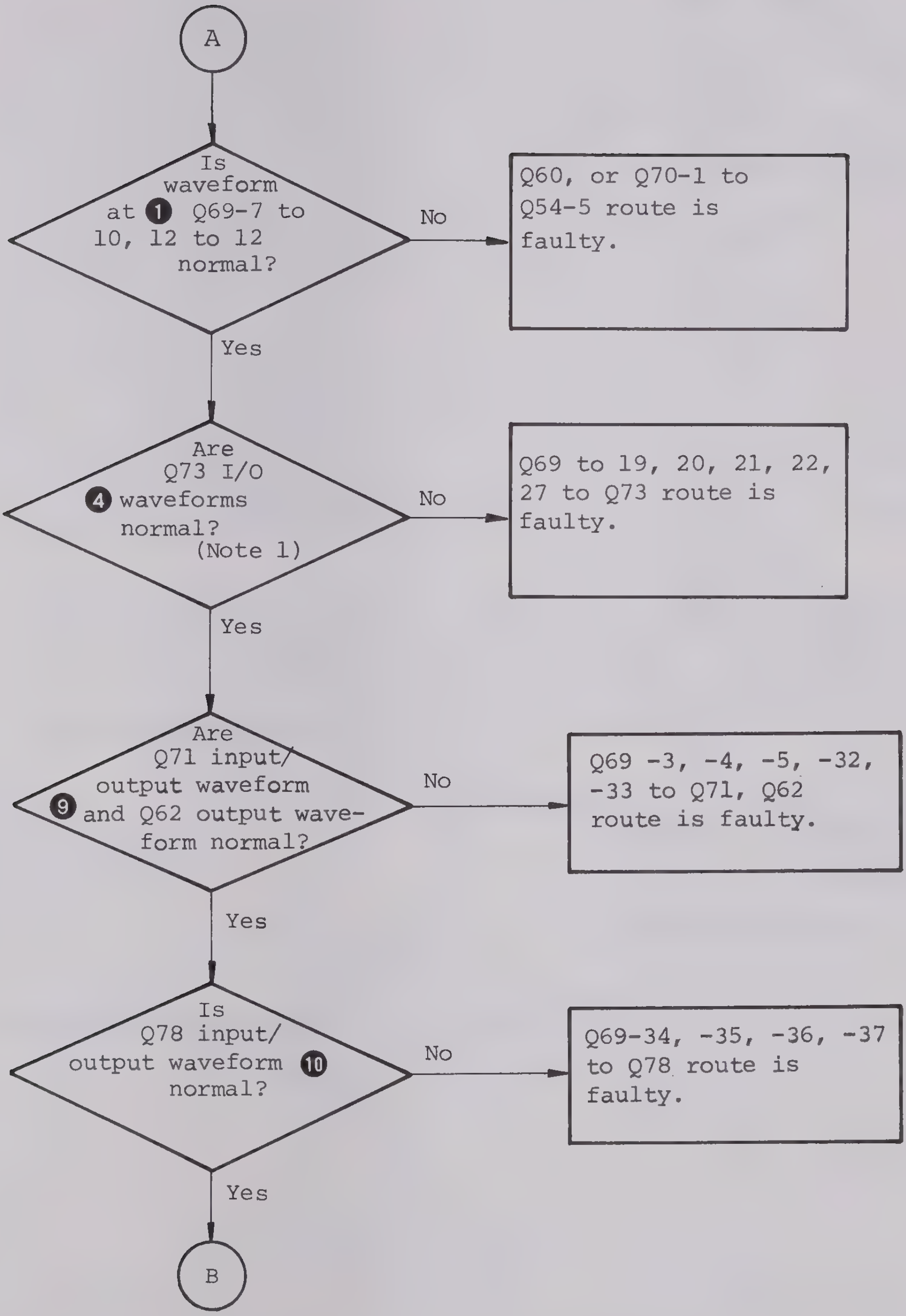

A
Is waveform at ❶ Q69-7 to 10, 12 to 12 normal?
No
Q60, or Q70-1 to Q54-5 route is faulty.
Yes
Are Q73 I/O ❹ waveforms normal? (Note 1)
No
Q69 to 19, 20, 21, 22, 27 to Q73 route is faulty.
Yes
Are Q71 input/ output waveform ❾ and Q62 output waveform normal?
No
Q69 -3, -4, -5, -32, -33 to Q71, Q62 route is faulty.
Yes
Is Q78 input/ output waveform ❿ normal?
No
Q69-34, -35, -36, -37 to Q78 route is faulty.
Yes
B

Fig. 3-63 (Cont.) Control Circuit Troubleshooting Flowchart

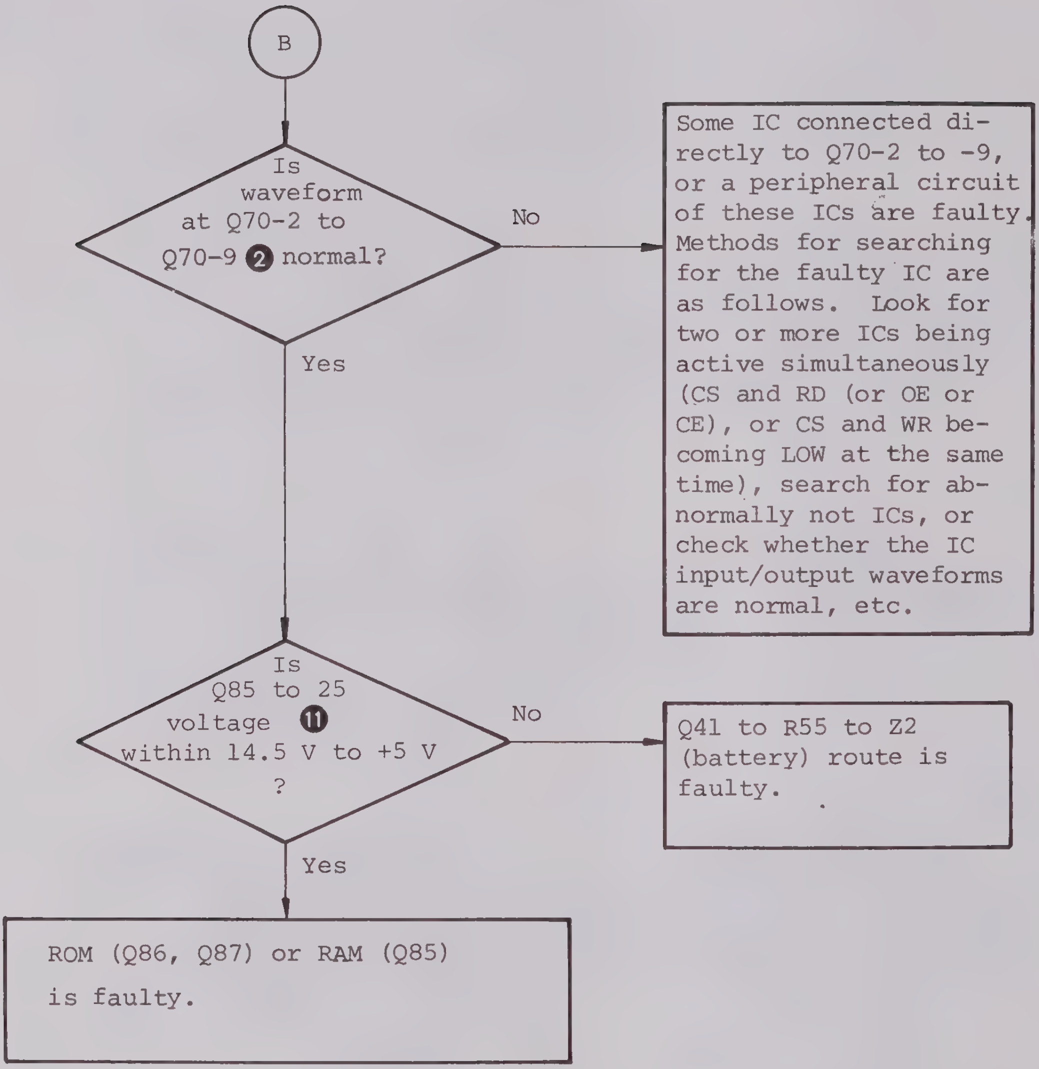

B
Is waveform at Q70-2 to Q70-9 ❷ normal?
No
Some IC connected directly to Q70-2 to -9, or a peripheral circuit of these ICs are faulty. Methods for searching for the faulty IC are as follows. Look for two or more ICs being active simultaneously (CS and RD (or OE or CE), or CS and WR becoming LOW at the same time), search for abnormally not ICs, or check whether the IC input/output waveforms are normal, etc.
Yes
Is Q85 to 25 voltage ⓫ within 14.5 V to +5 V ?
No
Q41 to R55 to Z2 (battery) route is faulty.
Yes
ROM (Q86, Q87) or RAM (Q85) is faulty.

Fig. 3-63 (Cont.) Control Circuit Troubleshooting Flowchart

3.3.18 Printer Troubleshooting

Refer to $\boxed{11}$ Control Circuit (Z2) 43W30649 (1/5, 4/5)

The checks below can be made using the receiver only. Supply printing paper to the printer.

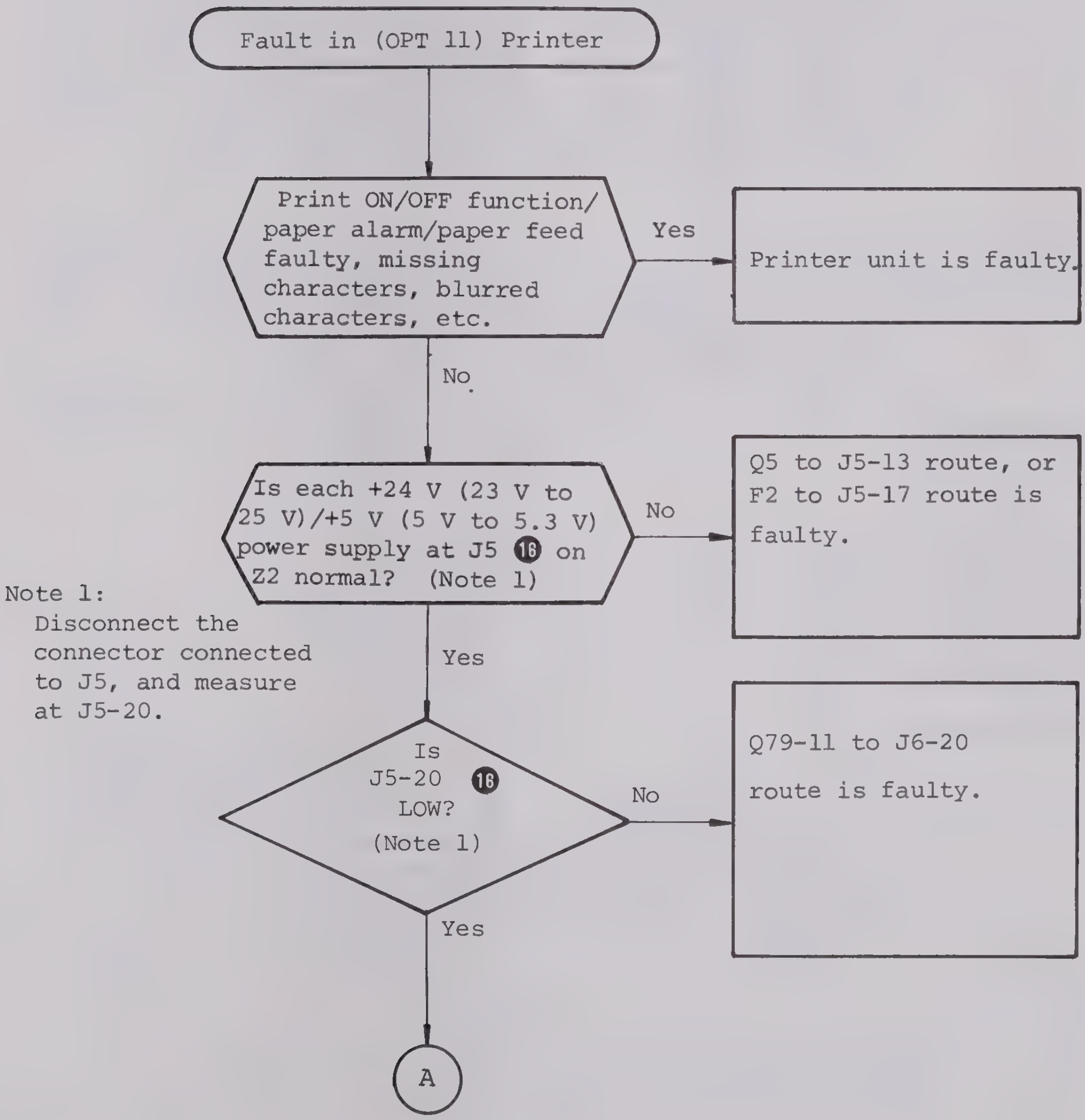
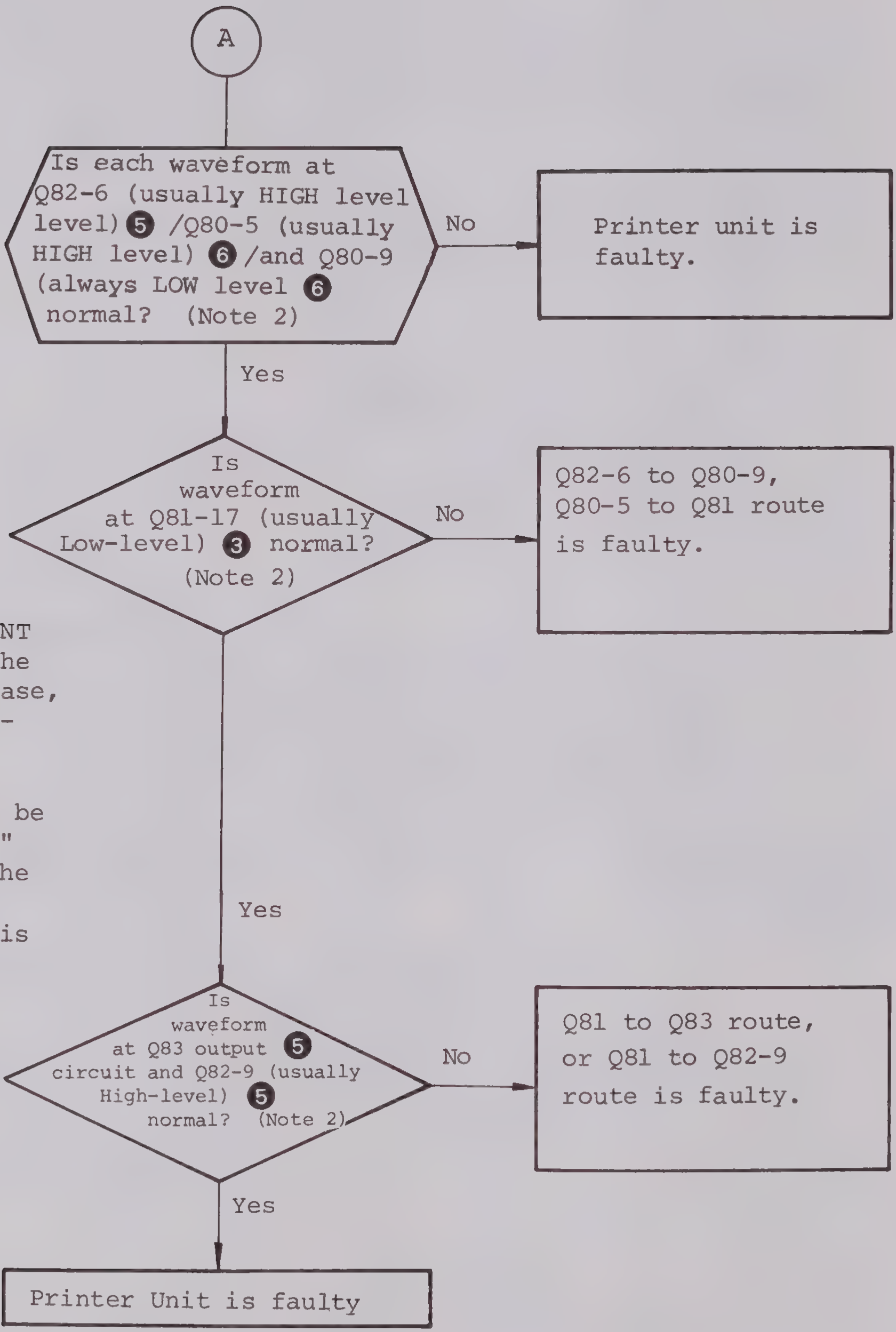

Fault in (OPT 11) Printer
Print ON/OFF function/ paper alarm/paper feed faulty, missing characters, blurred characters, etc.
Yes
Printer unit is faulty.
No
Is each +24 V (23 V to 25 V)/+5 V (5 V to 5.3 V) power supply at J5 ⑯ on Z2 normal? (Note 1)
No
Q5 to J5-13 route, or F2 to J5-17 route is faulty.
Note 1:
Disconnect the connector connected to J5, and measure at J5-20.
Yes
Is J5-20 ⑯ LOW? (Note 1)
No
Q79-11 to J6-20 route is faulty.
Yes
A

Fig. 3-64 Printer Troubleshooting Flowchart


A
Is each waveform at Q82-6 (usually HIGH level level) ⑤ /Q80-5 (usually HIGH level) ⑥ /and Q80-9 (always LOW level ⑥ normal? (Note 2)
No
Printer unit is faulty.
Yes
Is waveform at Q81-17 (usually Low-level) ③ normal? (Note 2)
No
Q82-6 to Q80-9, Q80-5 to Q81 route is faulty.
Yes
Is waveform at Q83 output ⑤ circuit and Q82-9 (usually High-level) ⑤ normal? (Note 2)
No
Q81 to Q83 route, or Q81 to Q82-9 route is faulty.
Yes
Printer Unit is faulty

Note 2:

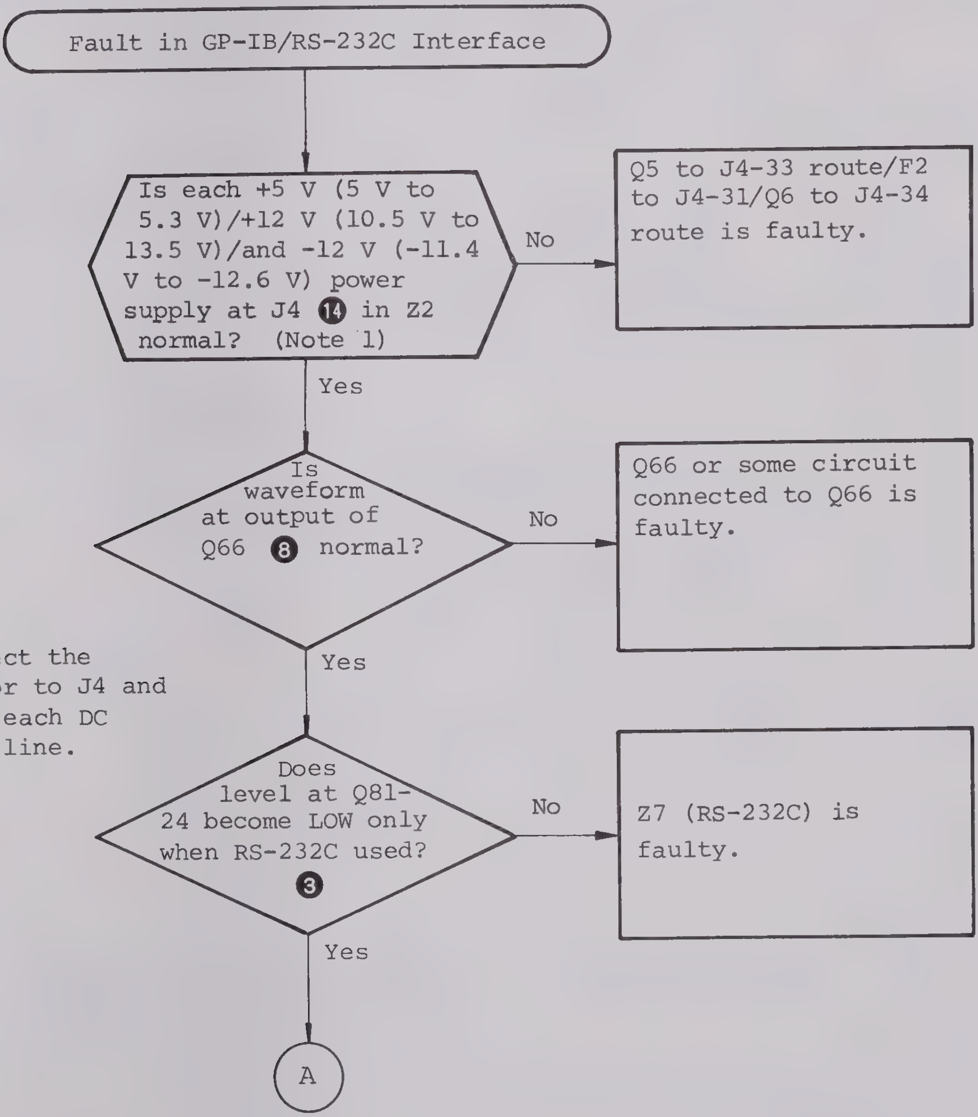
Press the MANUAL PRINT switch and observe the waveform. In this case, always start measurement previous to pressing the switch. The print switch can be ON or OFF. "Usually" in this flow means the state before the MANUAL PRINT switch is pressed.

Fig. 3-64 (Cont.) Printer Troubleshooting Flowchart

3.3.19 GP-IB or RS-232C Interface Troubleshooting

Refer to 11 Control Circuit (Z2): 43W30649 (1/5, 2/5, 4/5).

When making the checks below, connect the transmitter and receivers as shown in 2.5 Receiver Performance Check 2.5.2.4: "GP-IB interface check" of 4.5.25 "RS-232C interface check" of the Operation Manual, and check while executing the program.


Fault in GP-IB/RS-232C Interface
Is each +5 V (5 V to 5.3 V)/+12 V (10.5 V to 13.5 V)/and -12 V (-11.4 V to -12.6 V) power supply at J4 ⓮ in Z2 normal? (Note 1)
No
Q5 to J4-33 route/F2 to J4-31/Q6 to J4-34 route is faulty.
Yes
Is waveform at output of Q66 ❽ normal?
No
Q66 or some circuit connected to Q66 is faulty.
Yes
Does level at Q81-24 become LOW only when RS-232C used? ❸
No
Z7 (RS-232C) is faulty.
Yes
A

Note 1:

Disconnect the connector to J4 and measure each DC voltage line.

Fig. 3-65 GP-IB or RS-232C Interface Troubleshooting Flowchart

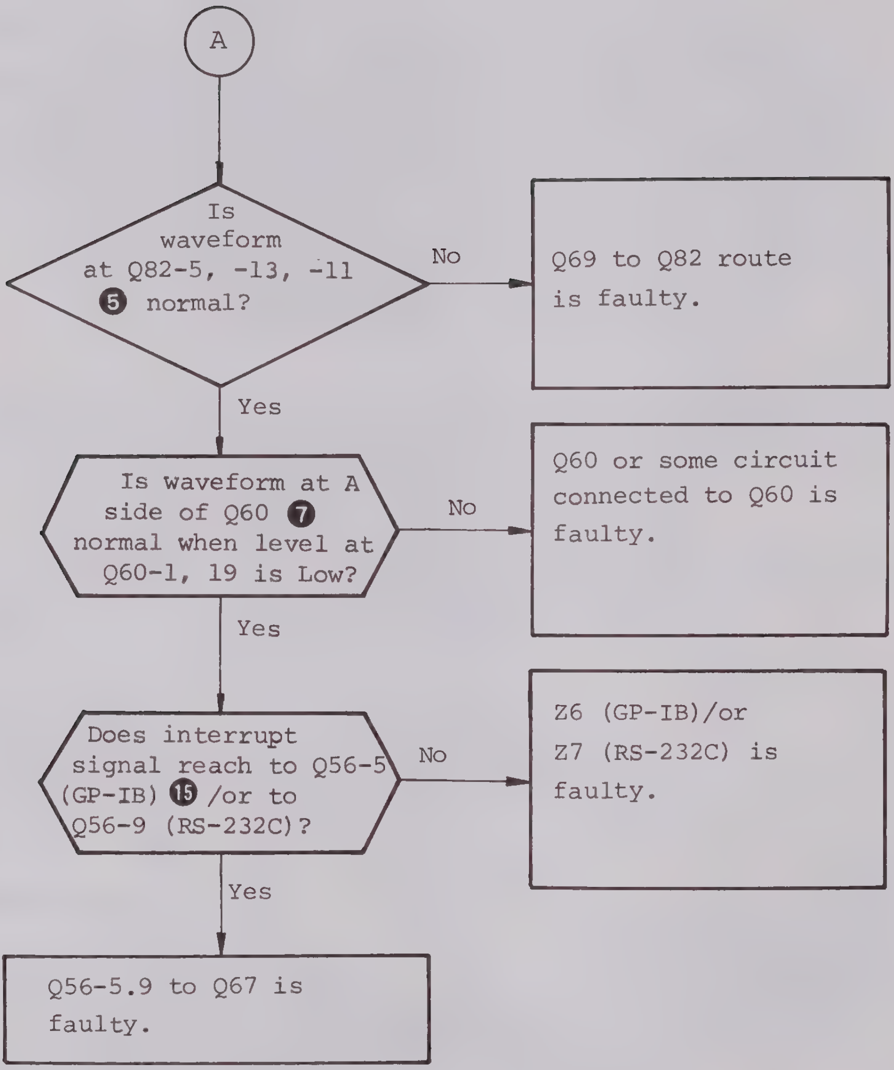

A
Is waveform at Q82-5, -13, -11 ❺ normal?
No
Q69 to Q82 route is faulty.
Yes
Is waveform at A side of Q60 ❼ normal when level at Q60-1, 19 is Low?
No
Q60 or some circuit connected to Q60 is faulty.
Yes
Does interrupt signal reach to Q56-5 (GP-IB) ⓯ /or to Q56-9 (RS-232C)?
No
Z6 (GP-IB)/or Z7 (RS-232C) is faulty.
Yes
Q56-5.9 to Q67 is faulty.

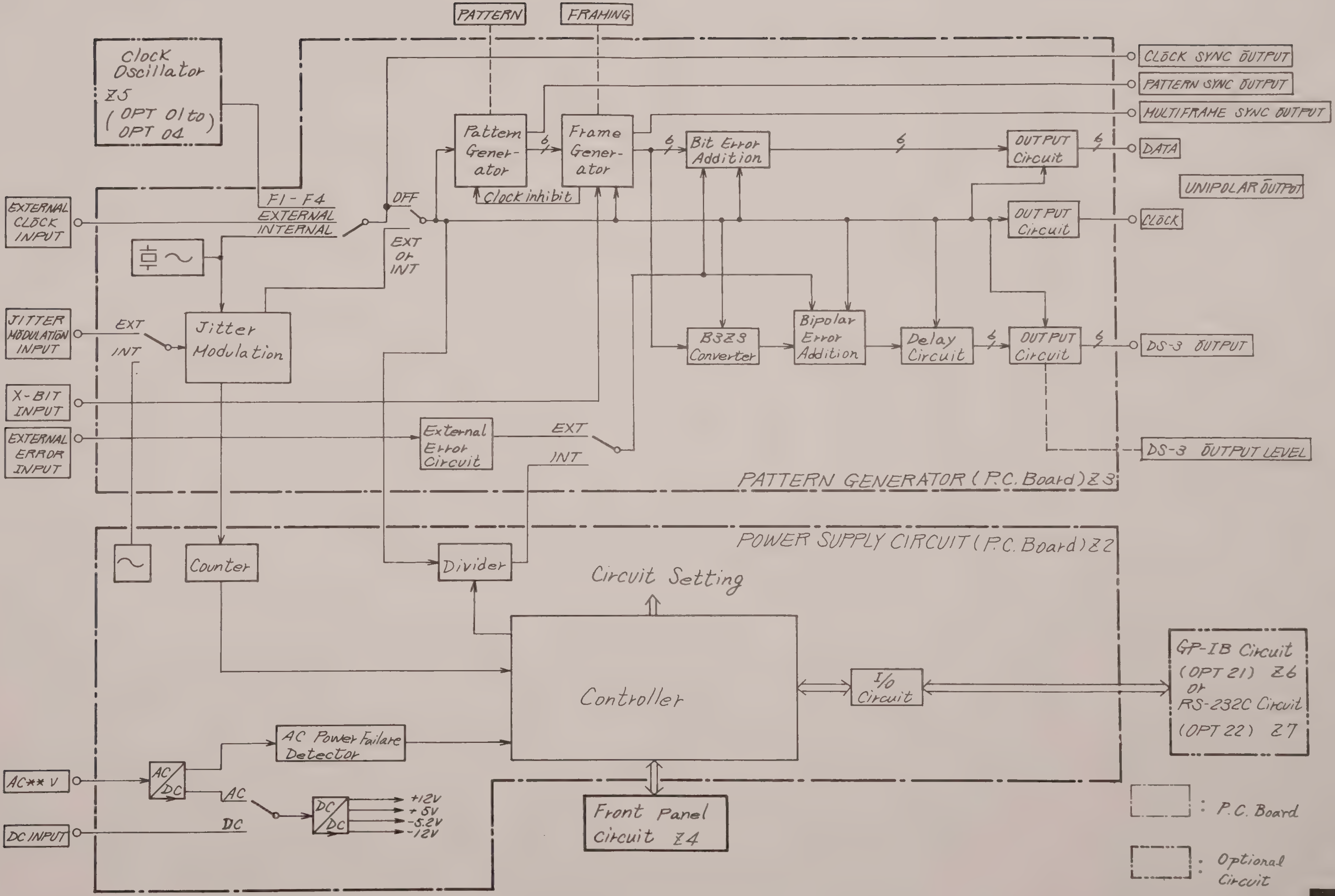
Fig. 3-65 (Cont.) GP-IB or RS-232C Interface Troubleshooting Flowchart

3.4 Block Diagram and Circuit Diagram

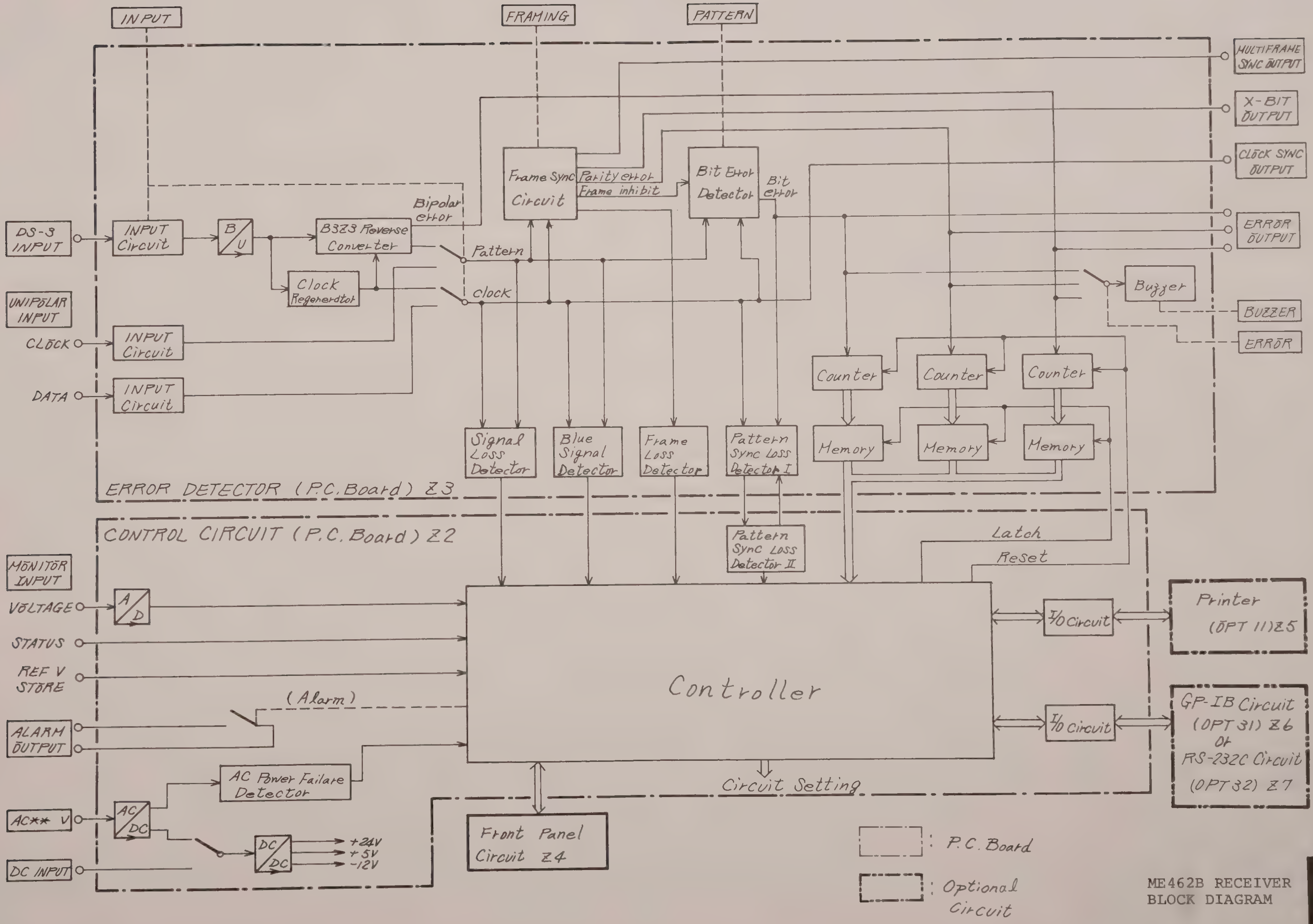
Table 3-9 lists the circuit names and the block/ circuit diagram numbers.

Table 3-9 List of Circuit No. vs. Block/Circuit Diagram

Circuit Diagram No.	Z No.	Name	Table No.
1		Block Diagram of ME462B Transmitter	
2		Block Diagram of ME462B Receiver	
3		Circuit Diagram of ME462B Transmitter Unit	Table 4-1
4	Z2	Circuit Diagram of POWER SUPPLY Circuit	Table 4-2
5	Z3	Circuit Diagram of PATTERN GENERATOR	Table 4-3
6	Z4	Circuit Diagram of FRONT PANEL Circuit	Table 4-4
7	Z5	Circuit Diagram of OPTION 01 to OPTION 04	Table 4-5
8	Z6	Circuit Diagram of GP-IB Interface Circuit	Table 4-6
9	Z7	Circuit Diagram of RS-232C Interface Circuit	Table 4-7
10		Circuit Diagram of ME462B Receiver Unit	Table 4-8
11	Z3	Circuit Diagram of BIT ERROR DETECTOR	Table 4-9
12	Z2	Circuit Diagram of CONTROLLER	Table 4-10
13	Z4	Circuit Diagram of FRONT PANEL Circuit	Table 4-11
14	Z8	Circuit Diagram of Switch Circuit	Table 4-12

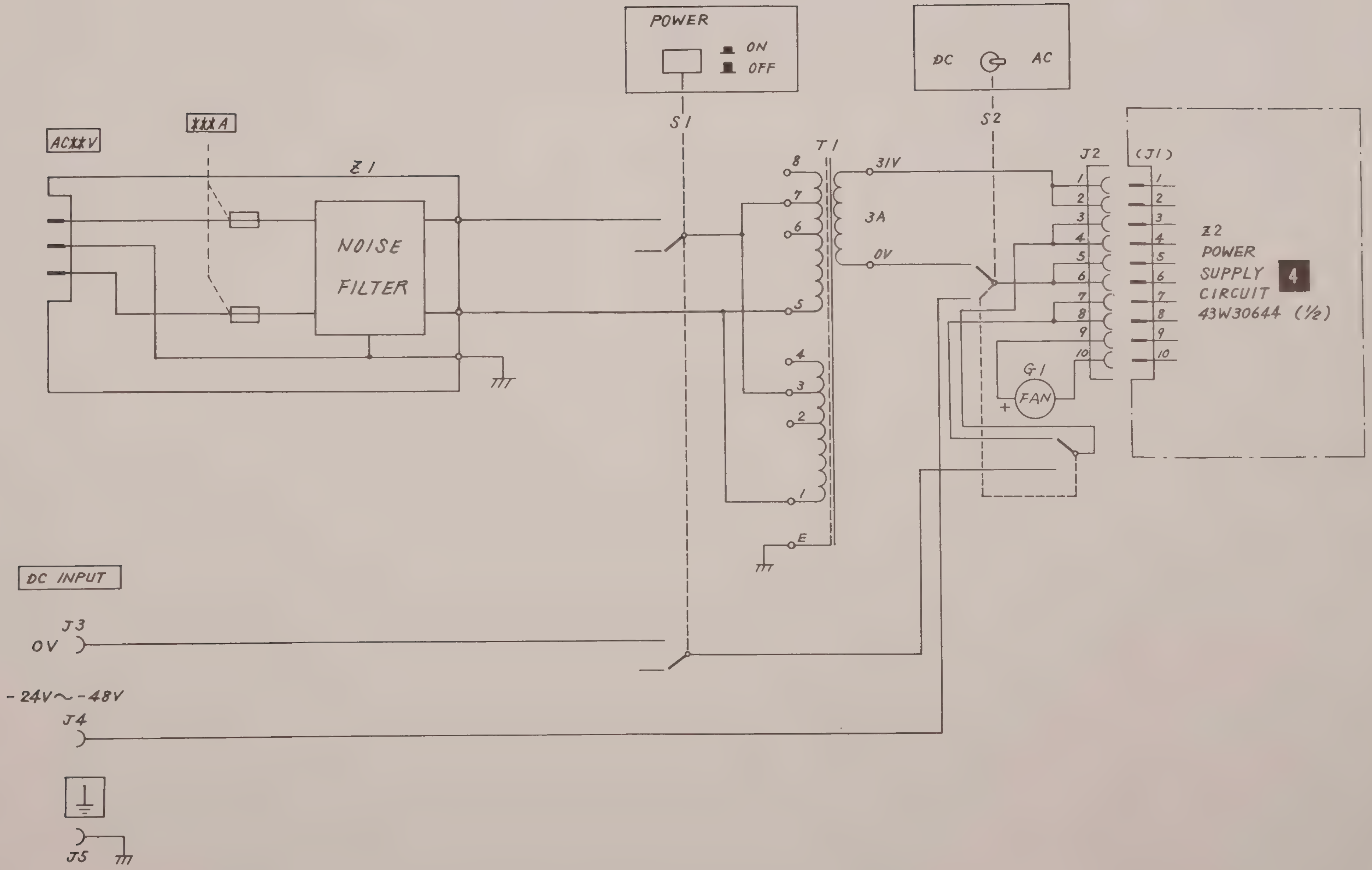

PATTERN
FRAMING
Clock Oscillator Z5 (OPT 01 to OPT 04)
F1 - F4
EXTERNAL
INTERNAL
OFF
EXT or INT
EXTERNAL CLOCK INPUT
Pattern Generator
Frame Generator
Clock inhibit
Bit Error Addition
OUTPUT Circuit
CLOCK SYNC OUTPUT
PATTERN SYNC OUTPUT
MULTIFRAME SYNC OUTPUT
DATA
UNIPOLAR OUTPUT
CLOCK
6
JITTER MODULATION INPUT
EXT
INT
Jitter Modulation
B3ZS Converter
Bipolar Error Addition
Delay Circuit
DS-3 OUTPUT
X-BIT INPUT
EXTERNAL ERROR INPUT
External Error Circuit
DS-3 OUTPUT LEVEL
PATTERN GENERATOR (P.C. Board) Z3
POWER SUPPLY CIRCUIT (P.C. Board) Z2
Counter
Divider
Circuit Setting
Controller
I/O Circuit
GP-IB Circuit (OPT 21) Z6 or RS-232C Circuit (OPT 22) Z7
AC Power Failure Detector
AC** V
AC/DC
AC
DC
DC/DC
DC INPUT
+12V
+5V
-5.2V
-12V
Front Panel Circuit Z4
: P.C. Board
: Optional Circuit

ME462B TRANSMITTER
BLOCK DIAGRAM


INPUT
FRAMING
PATTERN
MULTIFRAME SYNC OUTPUT
X-BIT OUTPUT
CLOCK SYNC OUTPUT
ERROR OUTPUT
DS-3 INPUT
INPUT Circuit
B/U
B3Z3 Reverse Converter
Bipolar error
Clock Regenerator
Frame Sync Circuit
Parity error
Frame inhibit
Bit Error Detector
Bit error
Pattern
clock
Buzzer
BUZZER
ERROR
UNIPOLAR INPUT
CLOCK
INPUT Circuit
DATA
INPUT Circuit
Counter
Counter
Counter
Memory
Memory
Memory
Signal Loss Detector
Blue Signal Detector
Frame Loss Detector
Pattern Sync Loss Detector I
ERROR DETECTOR (P.C. Board) Z3
CONTROL CIRCUIT (P.C. Board) Z2
Pattern Sync Loss Detector II
Latch
Reset
MONITOR INPUT
VOLTAGE
A/D
STATUS
REF V STORE
(Alarm)
ALARM OUTPUT
Controller
I/O Circuit
Printer (OPT 11) Z5
I/O Circuit
GP-IB Circuit (OPT 31) Z6 or RS-232C Circuit (OPT 32) Z7
AC Power Failure Detector
Circuit Setting
AC** V
AC/DC
DC/DC
+24V
+5V
-12V
DC INPUT
Front Panel Circuit Z4
: P.C. Board
: Optional Circuit

ME462B RECEIVER
BLOCK DIAGRAM

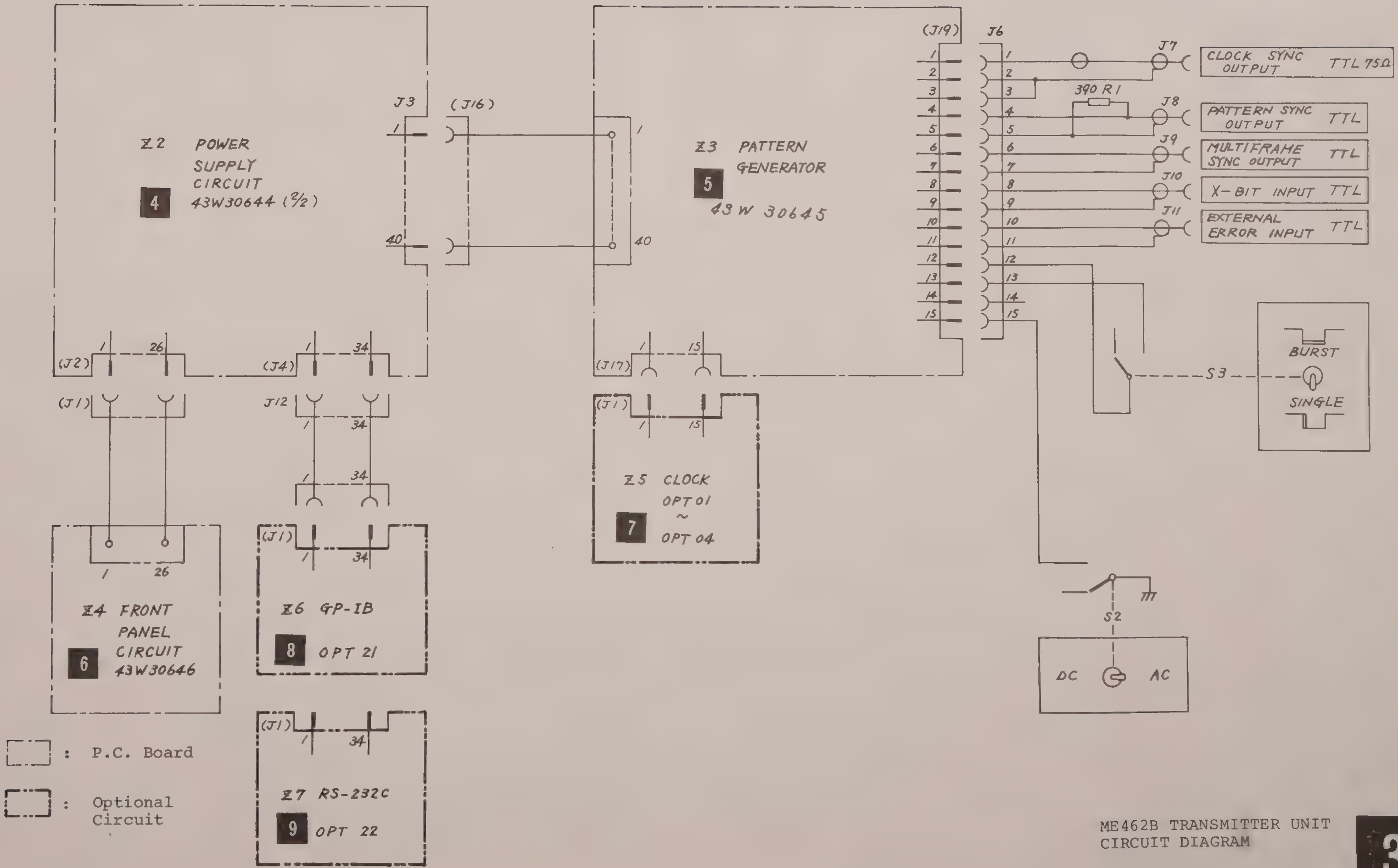
2


POWER
ON
OFF
DC
AC
S1
S2
AC**V
***A
Z1
NOISE
FILTER
T1
8
7
6
5
4
3
2
1
E
31V
3A
0V
J2
(J1)
1
2
3
4
5
6
7
8
9
10
Z2
POWER
SUPPLY
CIRCUIT
43W30644 (½)
4
G1
FAN
+
DC INPUT
J3
0V
-24V~-48V
J4
J5

Component List (Table 4-1)

ME462B TRANSMITTER UNIT
CIRCUIT DIAGRAM

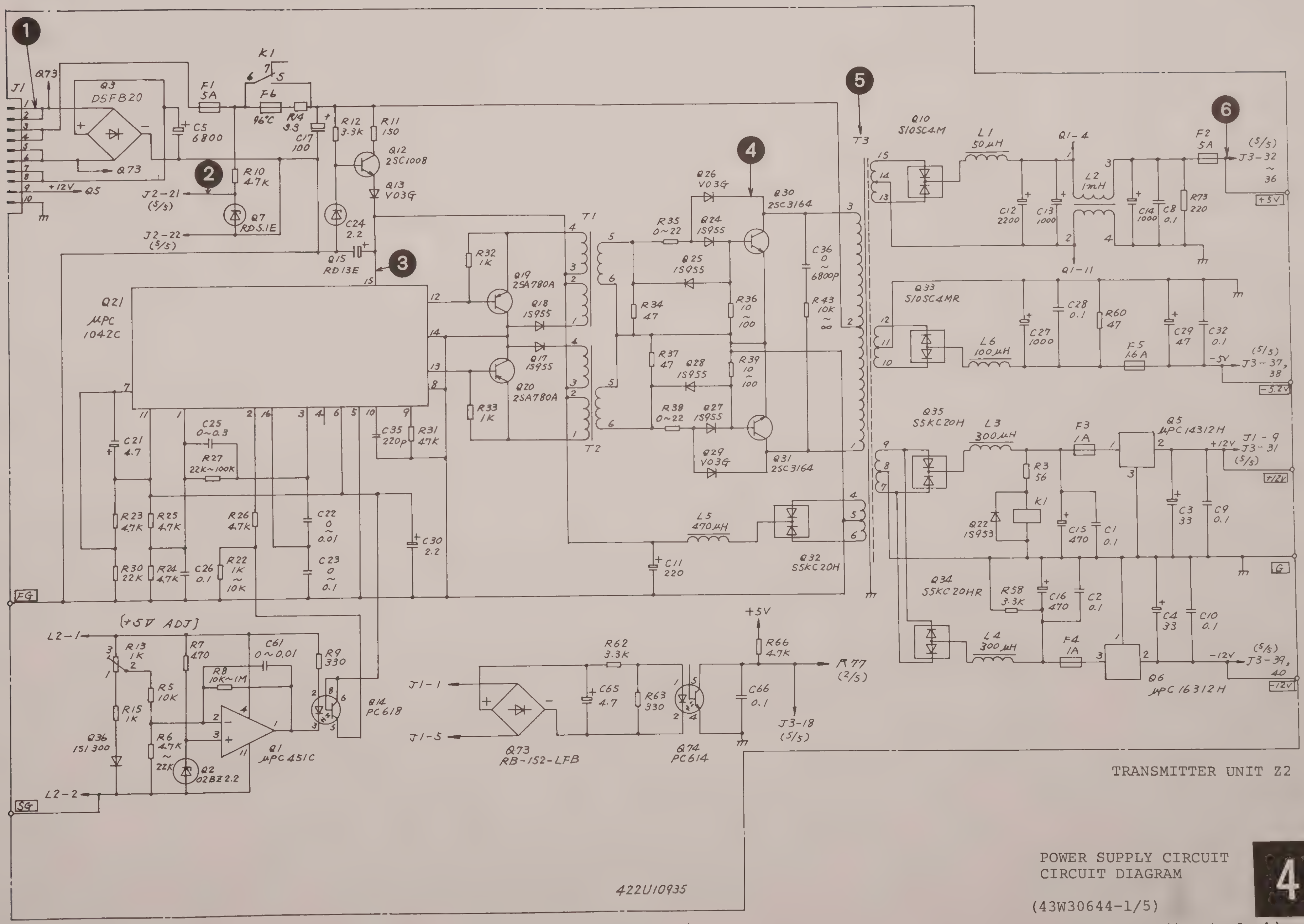
3


Z2 POWER SUPPLY CIRCUIT
4
43W30644 (2/2)
J3
(J16)
1
40
(J2)
1
26
(J4)
1
34
(J1)
J12
Z3 PATTERN GENERATOR
5
43 W 30645
(J19)
J6
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
(J17)
15
390 R1
J7
CLOCK SYNC OUTPUT TTL 75Ω
J8
PATTERN SYNC OUTPUT TTL
J9
MULTIFRAME SYNC OUTPUT TTL
J10
X-BIT INPUT TTL
J11
EXTERNAL ERROR INPUT TTL
S3
BURST
SINGLE
S2
DC
AC
Z4 FRONT PANEL CIRCUIT
6
43W30646
Z6 GP-IB
8
OPT 21
Z7 RS-232C
9
OPT 22
Z5 CLOCK
7
OPT 01 ~ OPT 04
: P.C. Board
: Optional Circuit

ME462B TRANSMITTER UNIT
CIRCUIT DIAGRAM

(43W30643-2/2)

3


①
②
③
④
⑤
⑥
J1
Q73
Q3
D5FB20
F1
5A
K1
F6
96°C
R14
3.3
C5
6800
C17
100
R12
3.3K
R11
150
Q12
2SC1008
Q13
V03G
R10
4.7K
Q73
+12V
Q5
J2-21
(5/5)
Q7
RD5.1E
J2-22
(5/5)
C24
2.2
Q15
RD13E
Q21
μPC
1042C
T1
T2
R32
1K
Q19
2SA780A
Q18
1S955
Q17
1S955
Q20
2SA780A
R33
1K
Q26
V03G
R35
0~22
Q24
1S955
Q25
1S955
Q30
2SC3164
C36
0~6800P
R34
47
R36
10~100
R43
10K~∞
R37
47
Q28
1S955
R39
10~100
R38
0~22
Q27
1S955
Q29
V03G
Q31
2SC3164
C25
0~0.3
R27
22K~100K
C21
4.7
C35
220P
R31
47K
R23
4.7K
R25
4.7K
R26
4.7K
C22
0~0.01
C30
2.2
R30
22K
R24
4.7K
C26
0.1
R22
1K~10K
C23
0~0.1
L5
470μH
C11
220
Q32
S5KC20H
FG
T3
Q10
S10SC4M
L1
50μH
Q1-4
L2
1mH
F2
5A
(5/5)
J3-32
~
36
+5V
C12
2200
C13
1000
C14
1000
C8
0.1
R73
220
Q1-11
Q33
S10SC4MR
C28
0.1
R60
47
C27
1000
L6
100μH
F5
1.6A
C29
47
C32
0.1
-5V
(5/5)
J3-37,
38
-5.2V
Q35
S5KC20H
L3
300μH
F3
1A
Q5
μPC14312H
+12V
J1-9
J3-31
(5/5)
+12V
R3
56
K1
Q22
1S953
C15
470
C1
0.1
C3
33
C9
0.1
G
Q34
S5KC20HR
R58
3.3K
C16
470
C2
0.1
C4
33
C10
0.1
L4
300μH
F4
1A
Q6
μPC16312H
-12V
(5/5)
J3-39,
40
-12V
(+5V ADJ)
L2-1
R13
1K
R7
470
C61
0~0.01
R8
10K~1M
R9
330
R5
10K
R15
1K
Q36
1S1300
R6
4.7K~22K
Q2
02BZ2.2
Q1
μPC451C
Q14
PC618
L2-2
SG
R62
3.3K
+5V
R66
4.7K
R77
(2/5)
J1-1
J1-5
C65
4.7
R63
330
C66
0.1
J3-18
(5/5)
Q73
RB-152-LFB
Q74
PC614
422U10935

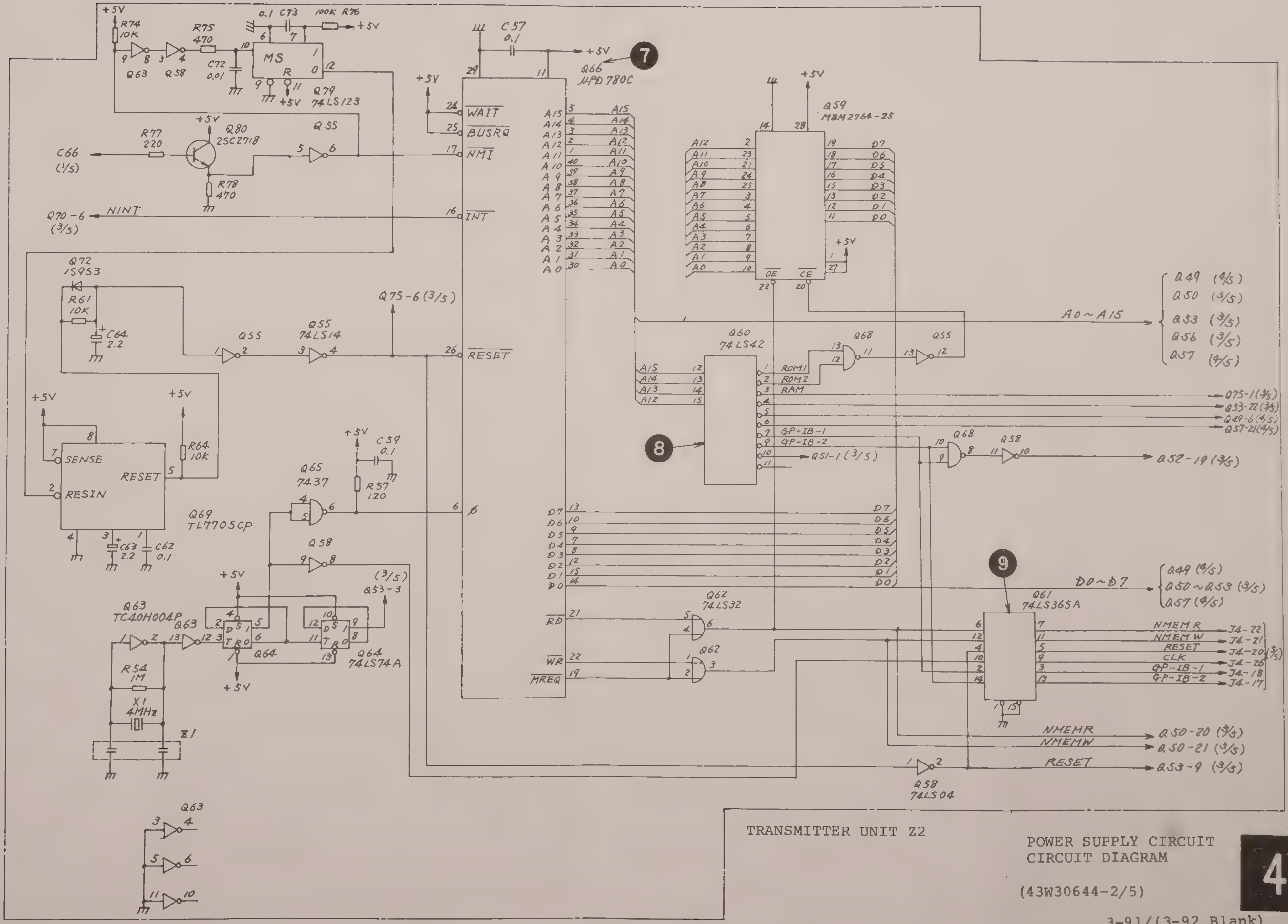
TRANSMITTER UNIT Z2

POWER SUPPLY CIRCUIT
CIRCUIT DIAGRAM

(43W30644-1/5)

4

Component List (Table 4-2)

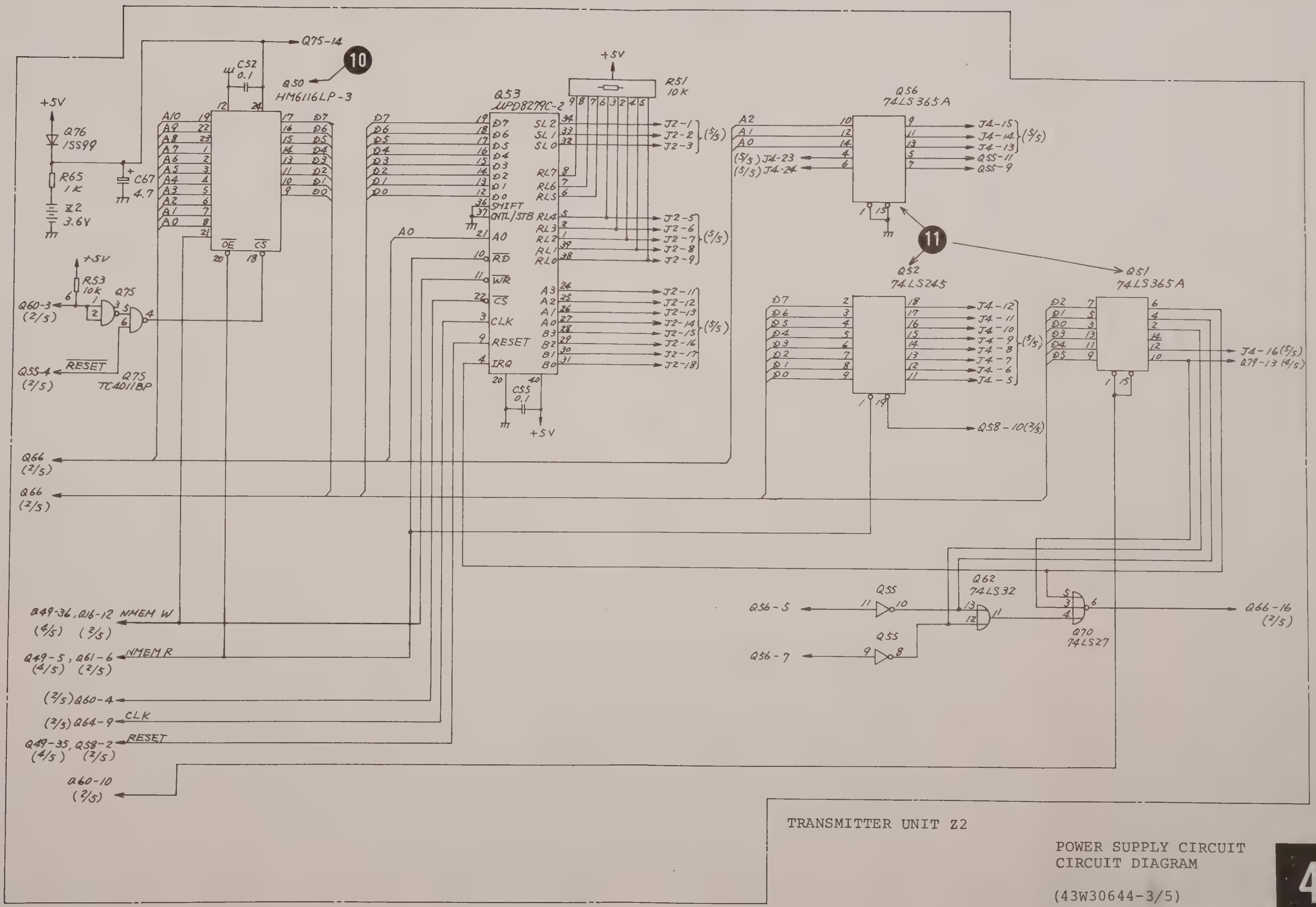

+5V
R74 10K
R75 470
0.1 C73
100K R76
MS
Q63
Q58
C72 0.01
Q79 74LS123
C57 0.1
Q66 μPD 780C
7
Q59 MBM2764-25
WAIT
BUSRQ
NMI
INT
RESET
RD
WR
MREQ
R77 220
C66 (1/5)
Q80 2SC2718
R78 470
Q55
NINT
Q70-6 (3/5)
Q72 1S953
R61 10K
C64 2.2
Q55 74LS14
Q75-6 (3/5)
SENSE
RESIN
R64 10K
Q69 TL7705CP
C63 2.2
C62 0.1
Q65 7437
C59 0.1
R57 120
ø
Q63 TC40H004P
R54 1M
X1 4MHz
Z1
Q64
Q64 74LS74A
(3/5) Q53-3
Q60 74LS42
Q68
ROM1
ROM2
RAM
GP-IB-1
GP-IB-2
Q51-1 (3/5)
8
A0~A15
Q49 (4/5)
Q50 (3/5)
Q53 (3/5)
Q56 (3/5)
Q57 (4/5)
Q75-1 (3/5)
Q53-22 (3/5)
Q49-6 (4/5)
Q57-21 (4/5)
Q52-19 (3/5)
9
D0~D7
Q49 (4/5)
Q50~Q53 (3/5)
Q57 (4/5)
Q61 74LS365A
Q62 74LS32
Q62
NMEMR
NMEMW
RESET
CLK
GP-IB-1
GP-IB-2
J4-22
J4-21
J4-20
J4-26
J4-18
J4-17
(5/5)
Q50-20 (3/5)
Q50-21 (3/5)
Q53-9 (3/5)
Q58 74LS04

TRANSMITTER UNIT Z2

POWER SUPPLY CIRCUIT
CIRCUIT DIAGRAM

(43W30644-2/5)

4

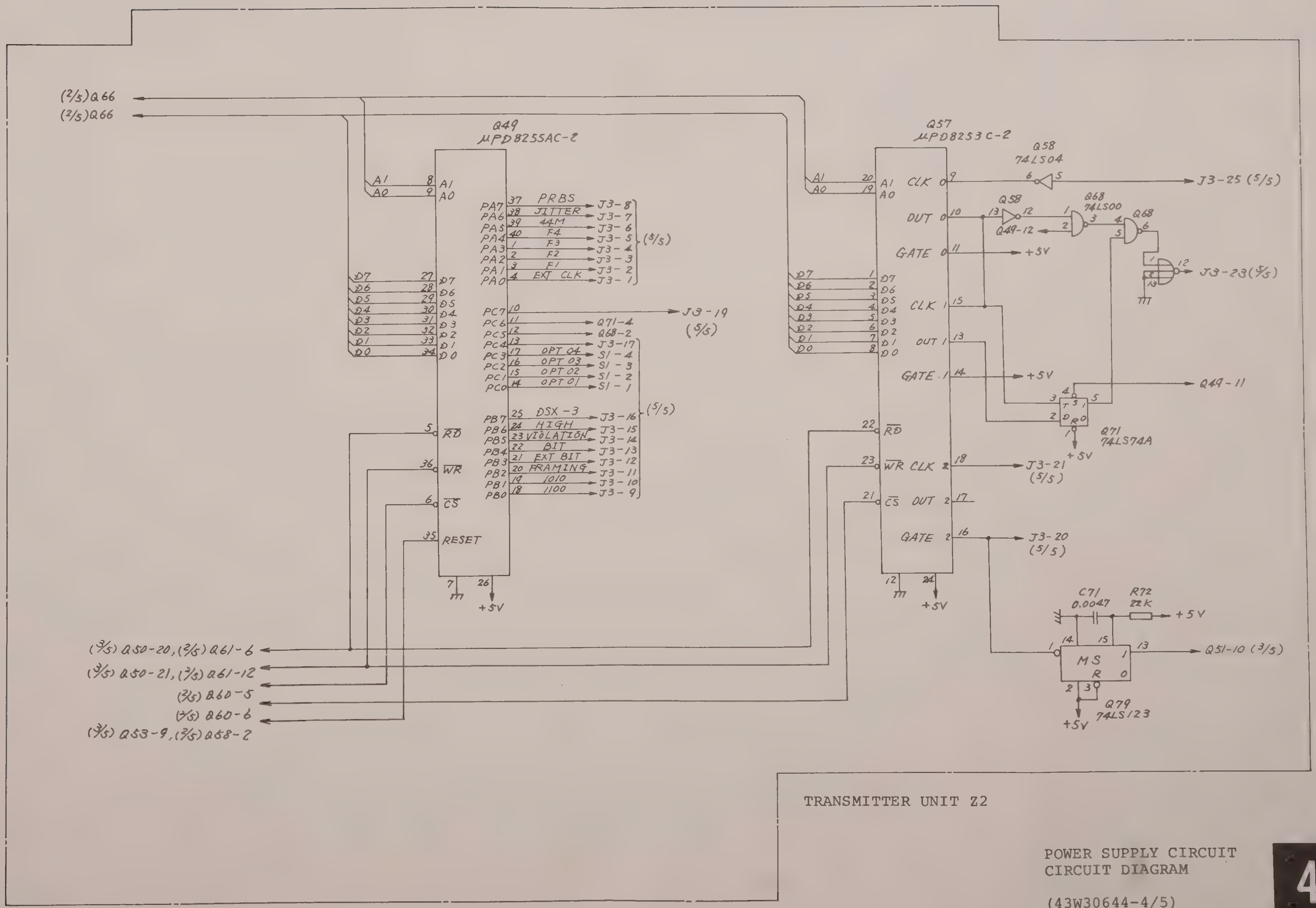

Q75-14
⑩
Q50
HM6116LP-3
C52
0.1
+5V
Q76
1SS99
R65
1K
Z2
3.6V
C67
4.7
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
D7
D6
D5
D4
D3
D2
D1
D0
OE
CS
R53
10K
Q75
Q60-3
(2/5)
RESET
Q55-4
(2/5)
Q75
TC4011BP
Q53
μPD8279C-2
SHIFT
CNTL/STB
RD
WR
CS
CLK
RESET
IRQ
SL2
SL1
SL0
RL7
RL6
RL5
RL4
RL3
RL2
RL1
RL0
A3
A2
A1
A0
B3
B2
B1
B0
C55
0.1
R51
10K
J2-1
J2-2
J2-3
(5/5)
J2-5
J2-6
J2-7
J2-8
J2-9
(5/5)
J2-11
J2-12
J2-13
J2-14
J2-15
J2-16
J2-17
J2-18
(5/5)
Q56
74LS365A
J4-15
J4-14
J4-13
(5/5)
Q55-11
Q55-9
(5/5) J4-23
(5/5) J4-24
⑪
Q52
74LS245
J4-12
J4-11
J4-10
J4-9
J4-8
J4-7
J4-6
J4-5
(5/5)
Q58-10(2/5)
Q51
74LS365A
J4-16(5/5)
Q79-13(4/5)
Q66
(2/5)
Q66
(2/5)
Q55
Q55
Q56-5
Q56-7
Q62
74LS32
Q70
74LS27
Q66-16
(2/5)
Q49-36, Q16-12 NMEM W
(4/5) (2/5)
Q49-5, Q61-6 NMEM R
(4/5) (2/5)
(2/5) Q60-4
(2/5) Q64-9 CLK
Q49-35, Q58-2 RESET
(4/5) (2/5)
Q60-10
(2/5)

TRANSMITTER UNIT Z2

POWER SUPPLY CIRCUIT
CIRCUIT DIAGRAM

(43W30644-3/5)

4

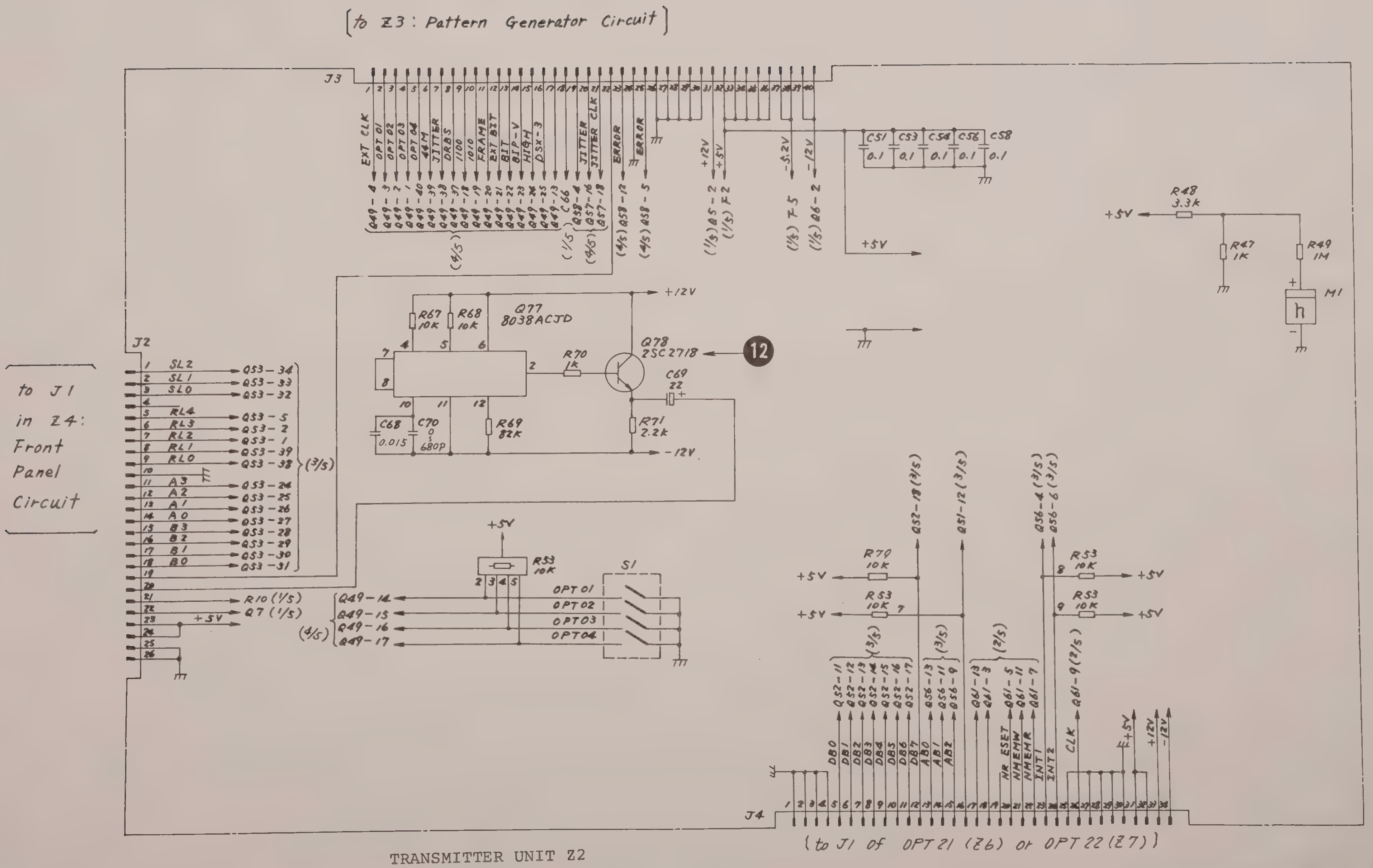

(2/5) Q66
(2/5) Q66
Q49
μPD8255AC-2
A1 8 A1
A0 9 A0
PA7 37 PRBS J3-8
PA6 38 JITTER J3-7
PA5 39 44M J3-6
PA4 40 F4 J3-5
PA3 1 F3 J3-4
PA2 2 F2 J3-3
PA1 3 F1 J3-2
PA0 4 EXT CLK J3-1
(5/5)
D7 27 D7
D6 28 D6
D5 29 D5
D4 30 D4
D3 31 D3
D2 32 D2
D1 33 D1
D0 34 D0
PC7 10 J3-19 (5/5)
PC6 11 Q71-4
PC5 12 Q68-2
PC4 13 J3-17
PC3 17 OPT 04 S1-4
PC2 16 OPT 03 S1-3
PC1 15 OPT 02 S1-2
PC0 14 OPT 01 S1-1
PB7 25 DSX-3 J3-16
PB6 24 HIGH J3-15
PB5 23 VIOLATION J3-14
PB4 22 BIT J3-13
PB3 21 EXT BIT J3-12
PB2 20 FRAMING J3-11
PB1 19 1010 J3-10
PB0 18 1100 J3-9
(5/5)
5 RD
36 WR
6 CS
35 RESET
7
26 +5V
Q57
μPD8253C-2
A1 20 A1
A0 19 A0
CLK 0 9
OUT 0 10
GATE 0 11 +5V
D7 1 D7
D6 2 D6
D5 3 D5
D4 4 D4
D3 5 D3
D2 6 D2
D1 7 D1
D0 8 D0
CLK 1 15
OUT 1 13
GATE 1 14 +5V
22 RD
23 WR CLK 2 18 J3-21 (5/5)
21 CS OUT 2 17
GATE 2 16 J3-20 (5/5)
12
24 +5V
Q58 74LS04 6 5 J3-25 (5/5)
Q58 13 12
Q49-12
Q68 74LS00 1 2 3
Q68 4 5 6
1 2 13 12 J3-23 (5/5)
4 3 T S 1 5 Q49-11
2 D R 0
Q71 74LS74A
1 +5V
C71 0.0047
R72 22K +5V
14 15
1 MS 1 13 Q51-10 (3/5)
R 0
2 3
Q79 74LS123
+5V
(3/5) Q50-20, (2/5) Q61-6
(3/5) Q50-21, (3/5) Q61-12
(3/5) Q60-5
(3/5) Q60-6
(3/5) Q53-9, (3/5) Q68-2

TRANSMITTER UNIT Z2

POWER SUPPLY CIRCUIT
CIRCUIT DIAGRAM

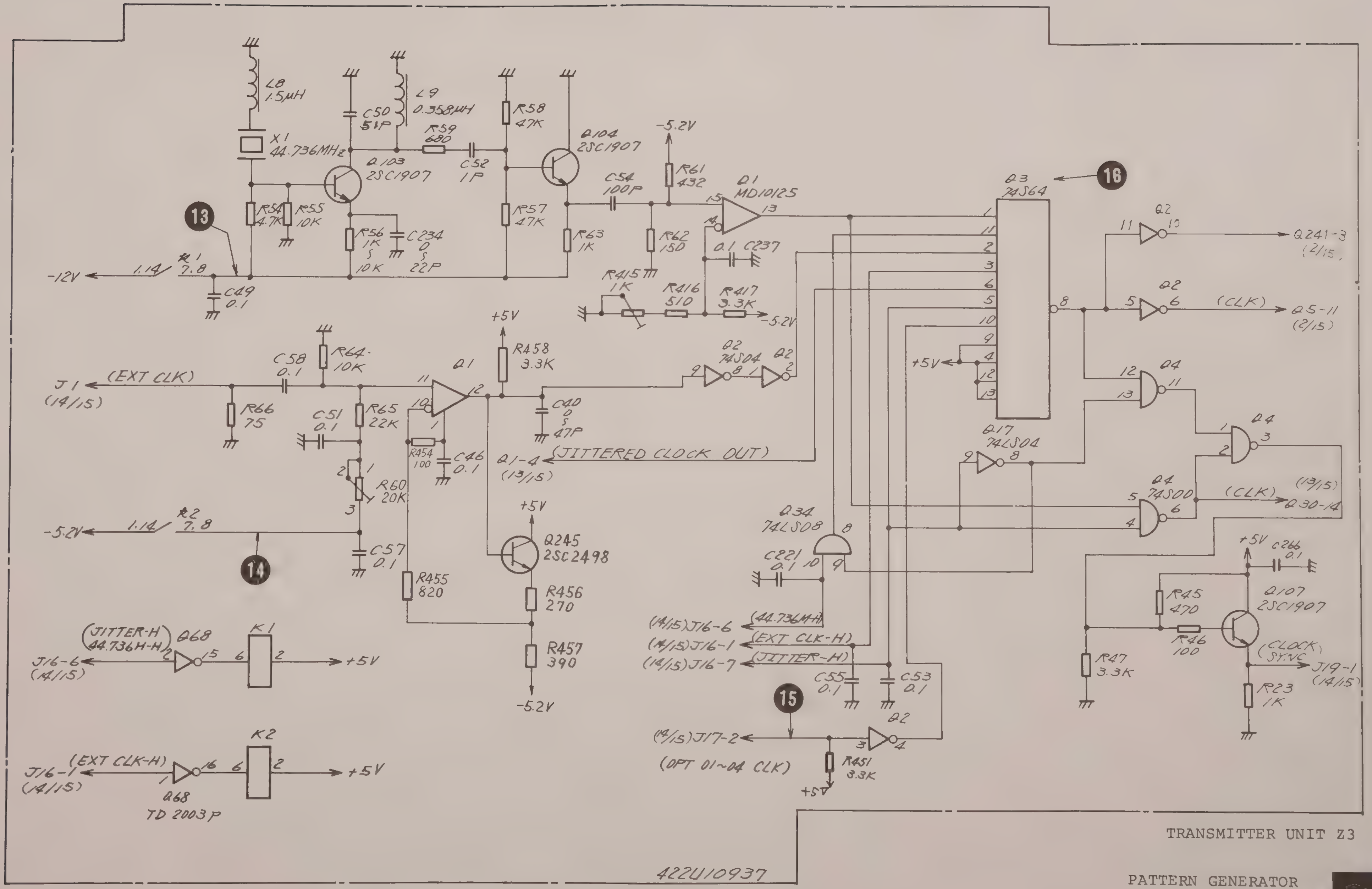
(43W30644-4/5)

4


[to Z3 : Pattern Generator Circuit]
J3
EXT CLK
OPT 01
OPT 02
OPT 03
OPT 04
44M
JITTER
DRBS
1100
1010
FRAME
EXT BIT
BIT
BIP-V
HIGH
DSX-3
JITTER
JITTER CLK
ERROR
ERROR
+12V
+5V
-5.2V
-12V
Q49-4
Q49-3
Q49-2
Q49-1
Q49-40
Q49-39
Q49-38
Q49-37
Q49-18
Q49-19
Q49-20
Q49-21
Q49-22
Q49-23
Q49-24
Q49-25
Q49-13
C66
Q58-4
Q57-16
Q57-18
(4/5)
(1/5)
(4/5)
(4/5) Q58-12
(4/5) Q58-5
(1/5) Q5-2
(1/5) F2
(1/5) F5
(1/5) Q6-2
C51
C53
C54
C56
C58
0.1
0.1
0.1
0.1
0.1
+5V
R48
3.3k
+5V
R47
1K
R49
1M
M1
h
+12V
R67
10K
R68
10K
Q77
8038ACJD
Q78
2SC2718
12
R70
1k
C69
22
C68
0.015
C70
680P
R69
82K
R71
2.2k
-12V
J2
to J1 in Z4: Front Panel Circuit
SL2
SL1
SL0
RL4
RL3
RL2
RL1
RL0
A3
A2
A1
A0
B3
B2
B1
B0
Q53-34
Q53-33
Q53-32
Q53-5
Q53-2
Q53-1
Q53-39
Q53-38
Q53-24
Q53-25
Q53-26
Q53-27
Q53-28
Q53-29
Q53-30
Q53-31
(3/5)
R10 (1/5)
Q7 (1/5)
+5V
+5V
R53
10K
S1
OPT 01
OPT 02
OPT03
OPT04
Q49-14
Q49-15
Q49-16
Q49-17
(4/5)
R70
10K
R53
10K
+5V
+5V
Q52-18 (3/5)
Q51-12 (3/5)
Q56-4 (3/5)
Q56-6 (3/5)
R53
10K
R53
10K
+5V
+5V
(3/5)
(3/5)
(2/5)
Q52-11
Q52-12
Q52-13
Q52-14
Q52-15
Q52-16
Q52-17
Q56-13
Q56-11
Q56-9
Q61-13
Q61-3
Q61-5
Q61-11
Q61-7
Q61-9 (2/5)
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
AB0
AB1
AB2
NR ESET
NMEMW
NMEMR
INT1
INT2
CLK
+5V
+12V
-12V
J4
(to J1 of OPT 21 (Z6) or OPT 22 (Z7))
TRANSMITTER UNIT Z2

POWER SUPPLY
CIRCUIT DIAGRAM

(43W30644-5/5)


L8
1.5μH
X1
44.736MHz
R54
4.7K
R55
10K
13
-12V
1.14
R1
7.8
C49
0.1
C50
51P
L9
0.358μH
R59
680
C52
1P
Q103
2SC1907
R56
1K
~
10K
C234
0
~
22P
R58
47K
R57
47K
Q104
2SC1907
R63
1K
C54
100P
-5.2V
R61
432
R62
150
Q1
MD10125
15
14
13
0.1
C237
R415
1K
R416
510
R417
3.3K
-5.2V
Q3
74S64
16
1
11
2
3
6
5
10
9
4
12
13
8
+5V
Q2
11
10
Q241-3
(2/15)
Q2
5
6
(CLK)
Q5-11
(2/15)
Q4
12
11
13
Q4
1
3
2
Q4
74S00
5
6
4
(CLK)
(13/15)
Q30-14
J1
(14/15)
(EXT CLK)
C58
0.1
R64
10K
R66
75
C51
0.1
R65
22K
Q1
11
10
12
1
+5V
R458
3.3K
R454
100
C46
0.1
C40
0
~
47P
Q2
74S04
9
8
1
Q2
2
Q1-4
(13/15)
(JITTERED CLOCK OUT)
R60
20K
2
1
3
-5.2V
1.14
R2
7.8
14
C57
0.1
R455
820
+5V
Q245
2SC2498
R456
270
R457
390
-5.2V
Q17
74LS04
9
8
Q34
74LS08
8
C221
0.1
10
9
(14/15)J16-6
(44.736M-H)
(14/15)J16-1
(EXT CLK-H)
(14/15)J16-7
(JITTER-H)
C55
0.1
C53
0.1
15
Q2
(14/15)J17-2
3
4
R451
3.3K
+5V
(OPT 01~04 CLK)
+5V
C266
0.1
R45
470
Q107
2SC1907
R46
100
R47
3.3K
(CLOCK)
(SYNC)
J19-1
(14/15)
R23
1K
(JITTER-H)
(44.736M-H)
Q68
J16-6
(14/15)
2
15
6
K1
2
+5V
J16-1
(14/15)
(EXT CLK-H)
1
16
6
K2
2
+5V
Q68
TD 2003P
422U10937

Component List (Table 4-3)

TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

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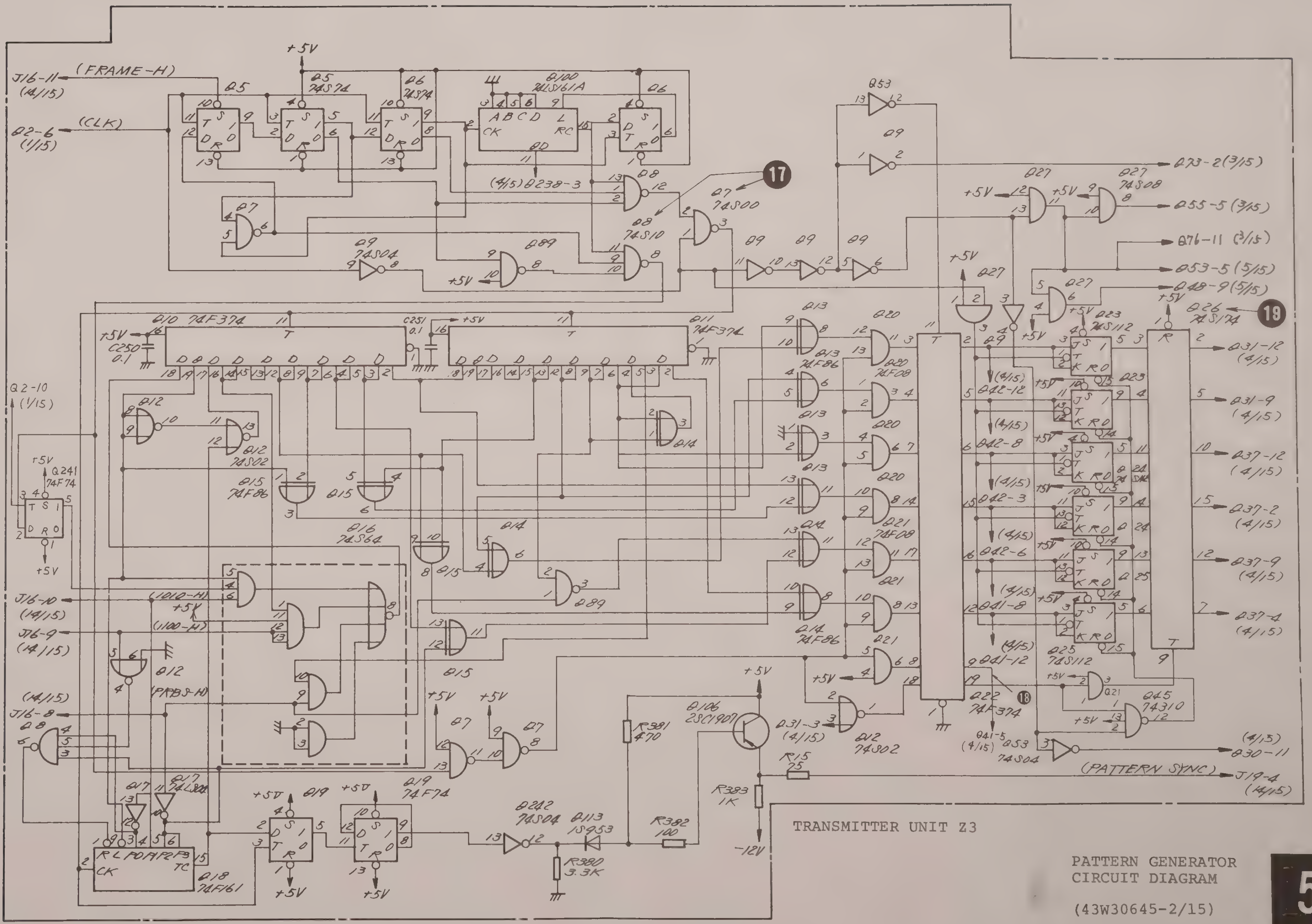
(43W30645-1/15)

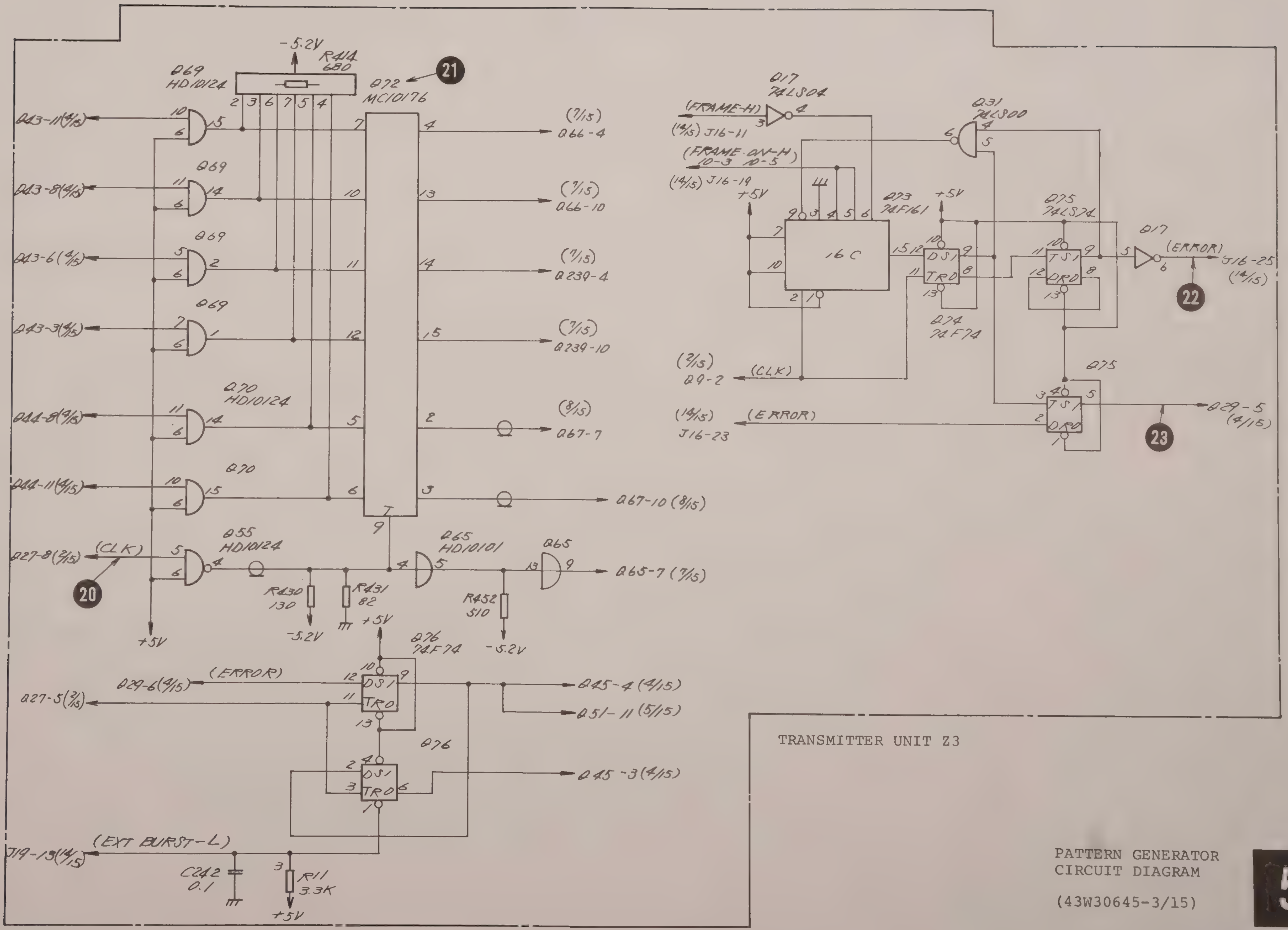

J16-11 (14/15)
(FRAME-H)
Q2-6 (1/15)
(CLK)
+5V
Q5
Q5 74S74
Q6 74S74
Q100 74LS161A
Q6
Q53
Q9
Q73-2 (3/15)
(4/15) Q238-3
Q8
Q7 74S00
Q8 74S10
17
Q7
Q9 74S04
Q89
Q27
Q27 74S08
Q55-5 (3/15)
Q76-11 (3/15)
Q53-5 (5/15)
Q48-9 (5/15)
Q26 74S174
19
Q10 74F374
C251 0.1
Q11 74F374
C250 0.1
Q13
Q20
Q13 74F86
Q20 74F08
Q23 74S112
Q31-12 (4/15)
Q31-9 (4/15)
Q37-12 (4/15)
Q37-2 (4/15)
Q37-9 (4/15)
Q37-4 (4/15)
Q2-10 (1/15)
Q12
Q12 74S02
Q14
Q241 74F74
Q15 74F86
Q15
Q16 74S64
(4/15) Q42-12
(4/15) Q42-8
(4/15) Q42-3
(4/15) Q42-6
(4/15) Q41-8
(4/15) Q41-12
Q21
Q21 74F08
Q14 74F86
Q25 74S112
J16-10 (14/15)
(1010-H)
(1100-H)
J16-9 (14/15)
(PRBS-H)
Q89
Q22 74F374
18
Q45 74S10
Q106 2SC1907
R381 470
Q31-3 (4/15)
Q12 74S02
Q41-5 (4/15)
Q53 74S04
Q30-11 (4/15)
(14/15) J16-8
Q8
Q7
Q19 74F74
R15 75
(PATTERN SYNC)
J19-4 (14/15)
R383 1K
-12V
Q17
Q17 74LS04
Q19
Q242 74S04
Q113 1S953
R382 100
R380 3.3K
Q18 74F161
+5V

TRANSMITTER UNIT Z3

PATTERN GENERATOR CIRCUIT DIAGRAM

(43W30645-2/15)

5

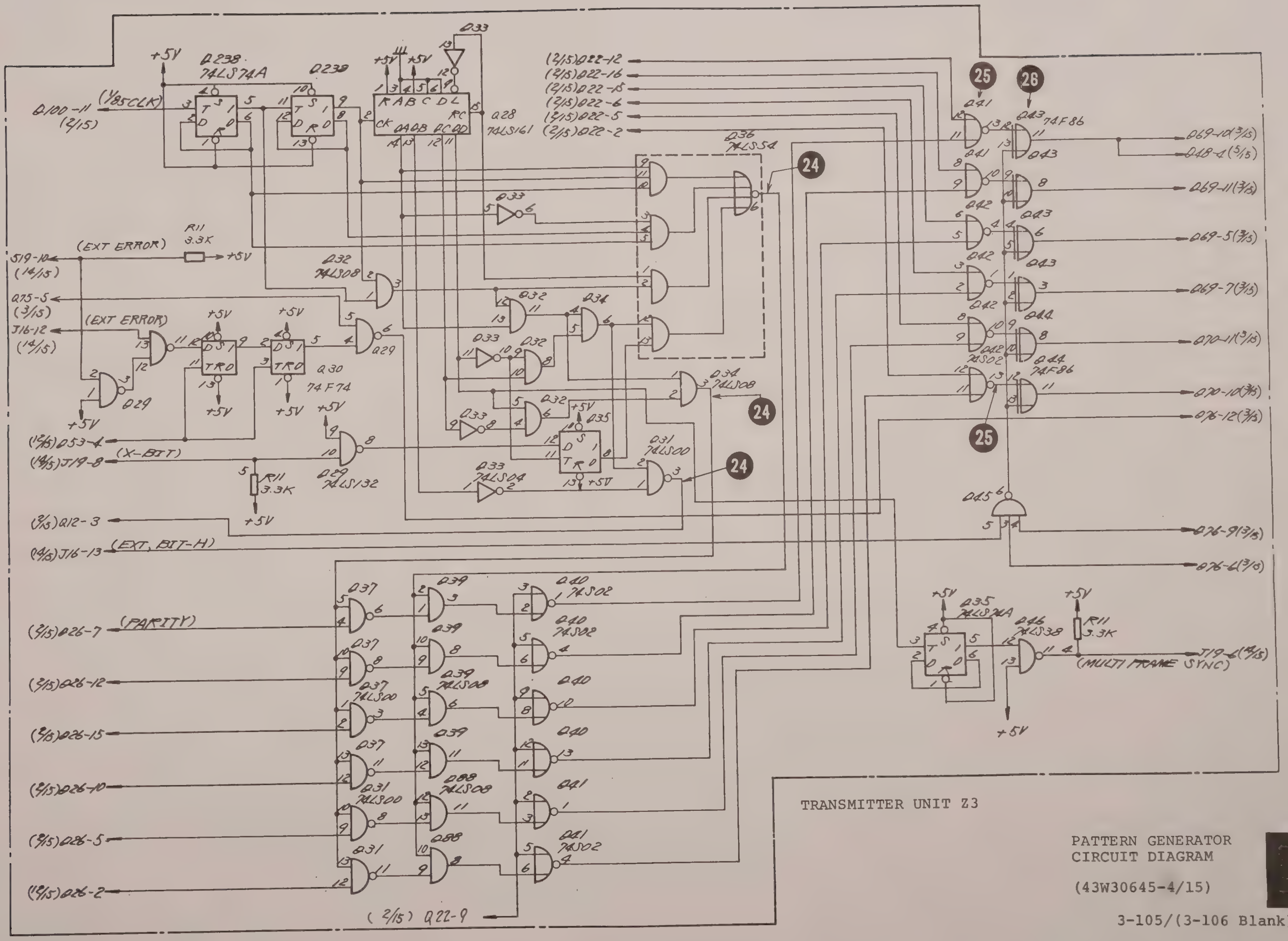

-5.2V
R414
680
Q69
HD10124
Q72
MC10176
21
Q43-11(4/15)
Q43-8(4/15)
Q43-6(4/15)
Q43-3(4/15)
Q44-8(4/15)
Q44-11(4/15)
Q27-8(2/15)
(CLK)
20
Q70
HD10124
Q55
HD10124
Q65
HD10101
(7/15) Q66-4
(7/15) Q66-10
(7/15) Q239-4
(7/15) Q239-10
(8/15) Q67-7
Q67-10 (8/15)
Q65-7 (7/15)
R430 130
R431 82
R452 510
+5V
-5.2V
Q76
74F74
(ERROR)
Q29-6(4/15)
Q27-5(2/15)
Q45-4 (4/15)
Q51-11 (5/15)
Q45-3(4/15)
DS1
TR0
J19-13(14/15)
(EXT BURST-L)
C242 0.1
R11 3.3K
Q17
74LS04
(FRAME-H)
(14/15) J16-11
(FRAME ON-H)
10-3 10-5
(14/15) J16-19
Q31
74LS00
Q73
74F161
16C
Q74
74F74
Q75
74LS74
Q17
(ERROR)
J16-25 (14/15)
22
(2/15) Q9-2
(CLK)
(14/15) J16-23
(ERROR)
Q29-5 (4/15)
23

TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-3/15)

5

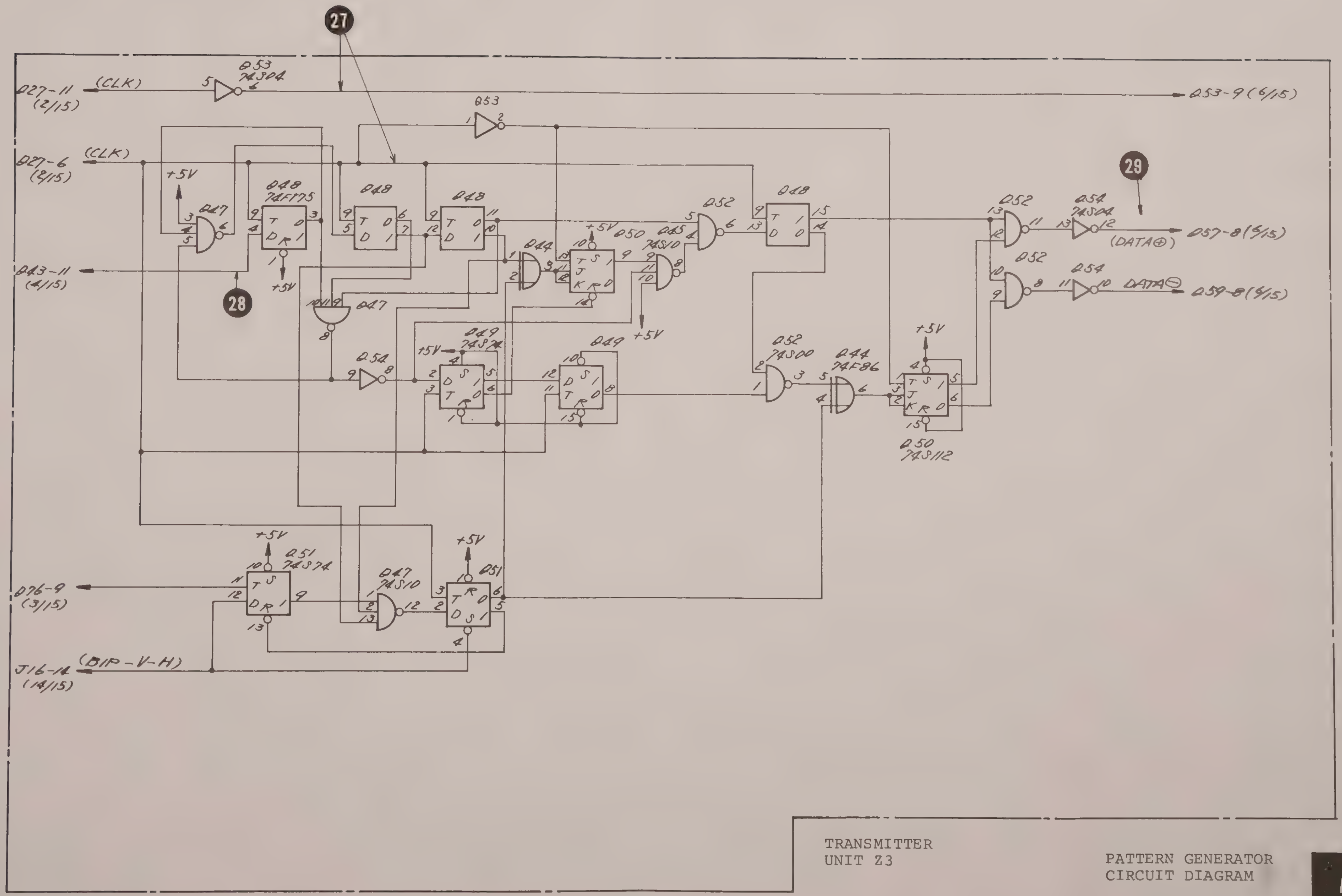

Q238
74LS74A
Q238
Q33
Q28
74LS161
(1/85CLK)
Q100-11
(2/15)
+5V
K A B C D L
RC
CK QA QB QC QD
(2/15)Q22-12
(2/15)Q22-16
(2/15)Q22-15
(2/15)Q22-6
(2/15)Q22-5
(2/15)Q22-2
Q36
74LS54
Q41
Q43 74F86
Q42
Q44
74S02
74F86
Q69-10(3/15)
Q48-4(5/15)
Q69-11(3/15)
Q69-5(3/15)
Q69-7(3/15)
Q70-11(3/15)
Q70-10(3/15)
Q76-12(3/15)
Q76-9(3/15)
Q76-6(3/15)
Q45
(EXT ERROR)
R11
3.3K
S19-10
(14/15)
Q75-5
(3/15)
J16-12
(14/15)
Q32
74LS08
Q29
Q30
74F74
Q34
74LS08
Q35
Q31
74LS00
Q33
74LS04
(12/15)Q53-4
(14/15)J19-8
(X-BIT)
Q29
74LS132
(3/15)Q12-3
(14/15)J16-13
(EXT, BIT-H)
Q37
Q39
Q40
74S02
74LS08
Q31
74LS00
Q38
74LS08
Q41
74S02
(PARITY)
(3/15)Q26-7
(3/15)Q26-12
(3/15)Q26-15
(3/15)Q26-10
(3/15)Q26-5
(12/15)Q26-2
(2/15) Q22-9
Q35
74LS74A
Q46
74LS38
J19-6(14/15)
(MULTI FRAME SYNC)
24
25
26

TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-4/15)

5

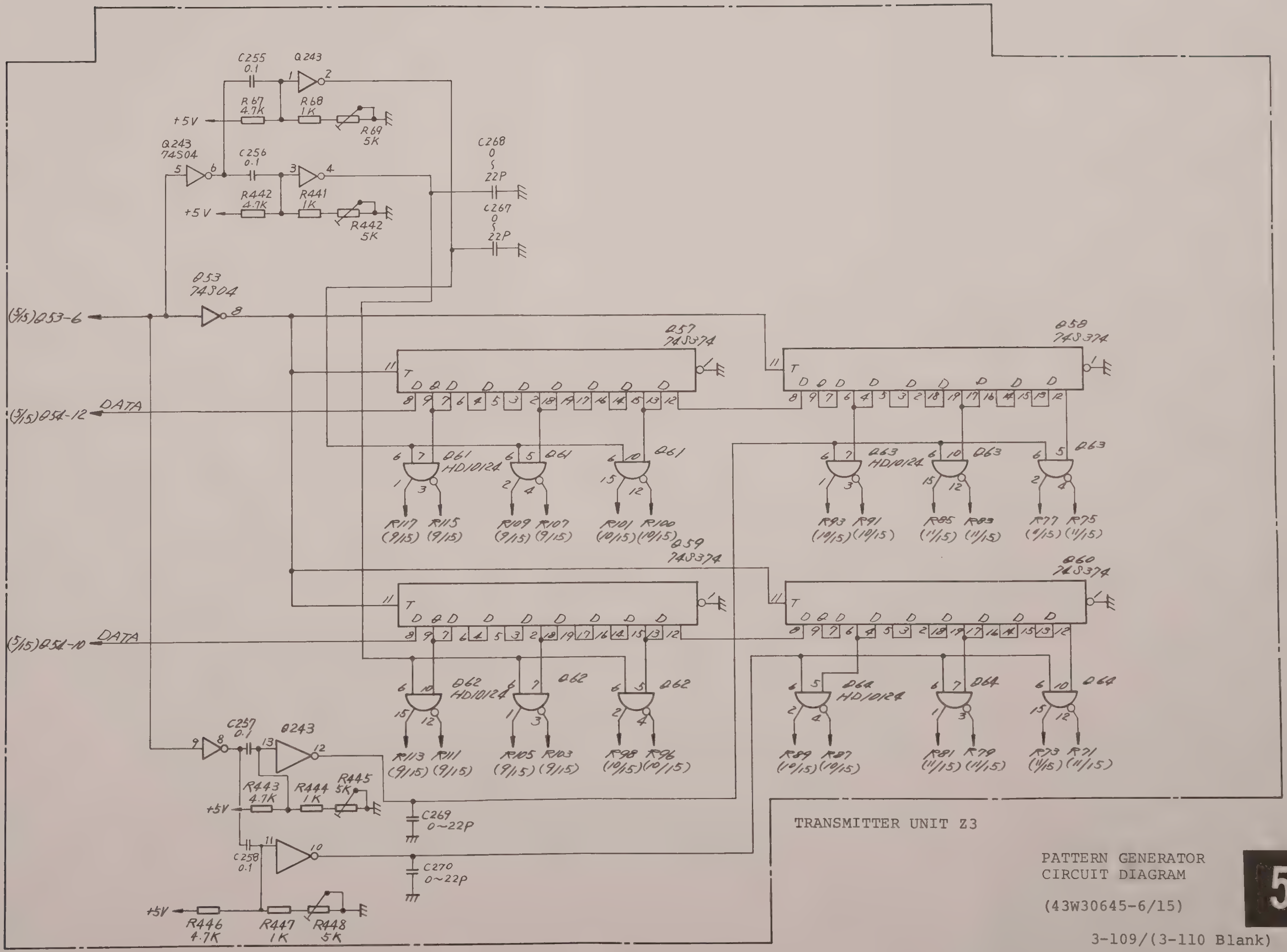

27
28
29
Q27-11 (2/15)
(CLK)
Q53 74S04
Q53-9 (6/15)
Q53
Q27-6 (2/15)
(CLK)
+5V
Q27
Q48 74F175
Q48
Q48
Q43-11 (4/15)
Q44
+5V Q50
Q45 74S10
Q52
Q48
Q52
Q54 74S04
(DATA⊕)
Q57-8 (5/15)
Q52
Q54
DATA⊖
Q59-8 (5/15)
Q47
Q54
Q49 74S74
Q49
+5V
Q52 74S00
Q44 74F86
+5V
Q50 74S112
+5V
Q51 74S74
+5V
Q51
Q47 74S10
Q76-9 (3/15)
J16-12 (BIP-V-H) (14/15)

TRANSMITTER
UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-5/15)

5

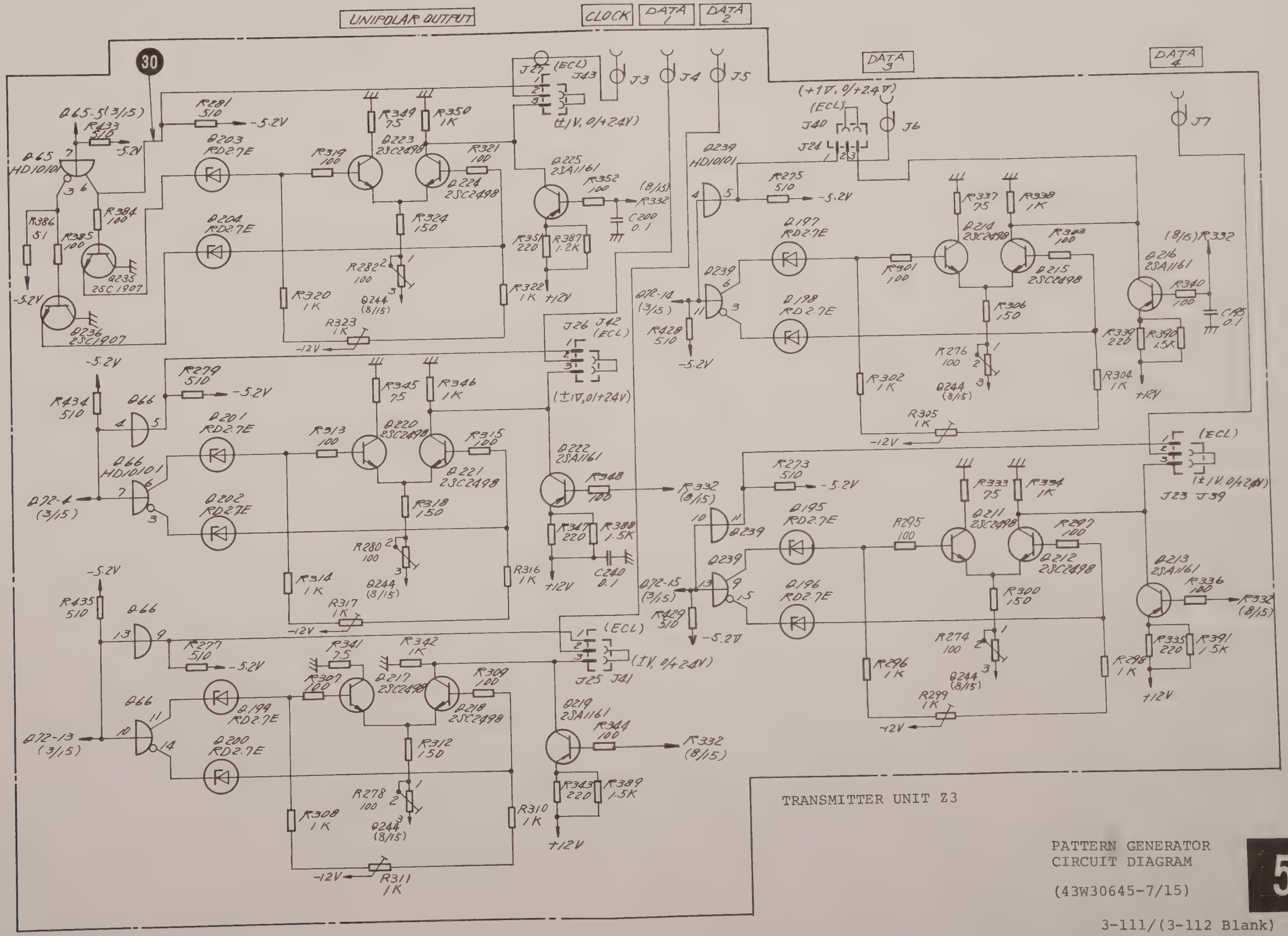

C255 0.1
Q243
R67 4.7K
R68 1K
R69 5K
+5V
Q243 74S04
C256 0.1
R442 4.7K
R441 1K
R442 5K
C268 0 ~ 22P
C267 0 ~ 22P
Q53 74S04
(5/15)Q53-6
Q57 74S374
Q58 74S374
Q59 74S374
Q60 74S374
(5/15)Q54-12 DATA
(5/15)Q54-10 DATA
Q61 HD10124
Q62 HD10124
Q63 HD10124
Q64 HD10124
R117 (9/15)
R115 (9/15)
R109 (9/15)
R107 (9/15)
R101 (10/15)
R100 (10/15)
R93 (10/15)
R91 (10/15)
R85 (11/15)
R83 (11/15)
R77 (11/15)
R75 (11/15)
R113 (9/15)
R111 (9/15)
R105 (9/15)
R103 (9/15)
R98 (10/15)
R96 (10/15)
R89 (10/15)
R87 (10/15)
R81 (11/15)
R79 (11/15)
R73 (11/15)
R71 (11/15)
C257 0.1
Q243
R443 4.7K
R444 1K
R445 5K
C269 0~22P
C258 0.1
C270 0~22P
R446 4.7K
R447 1K
R448 5K

TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-6/15)

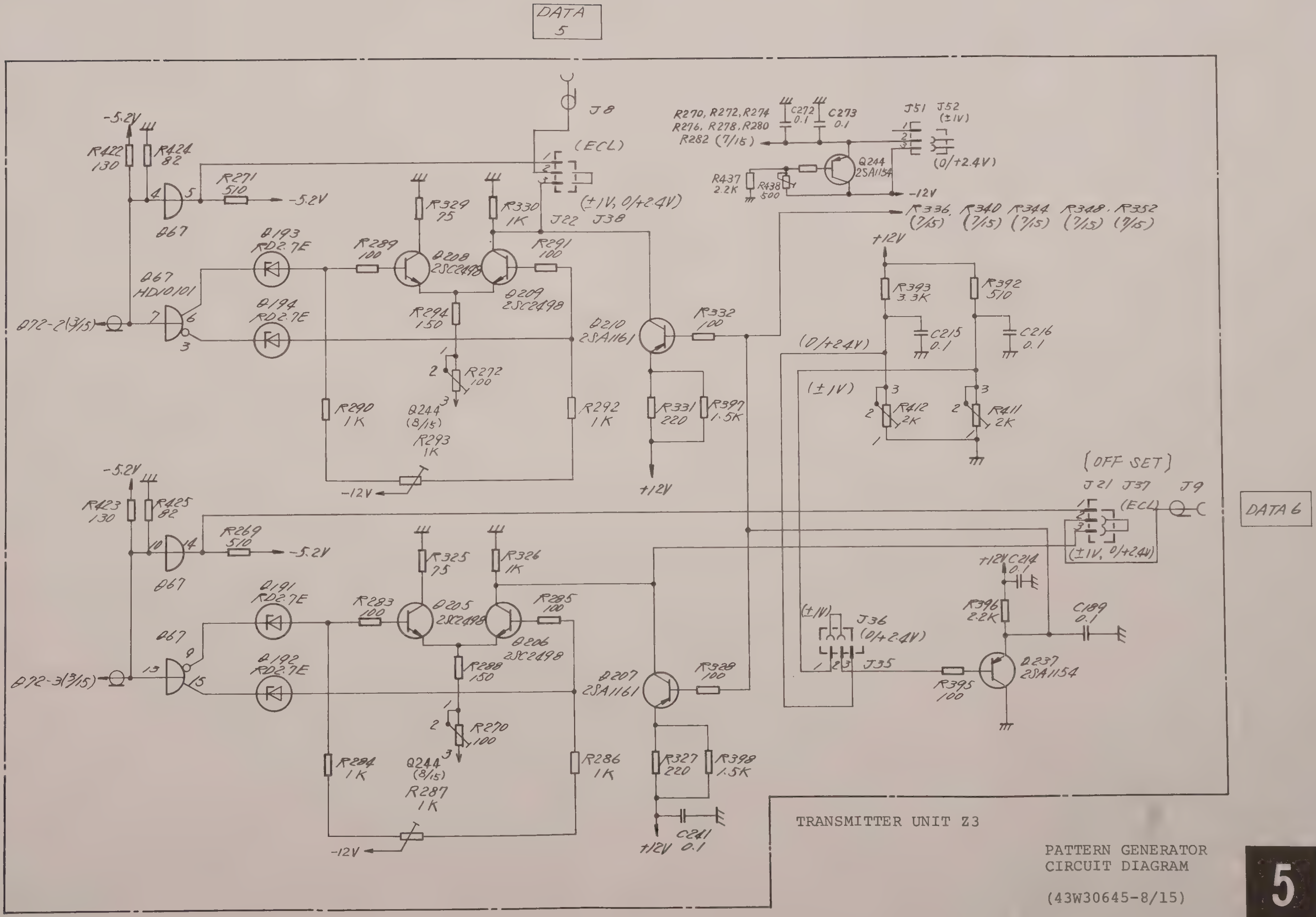
5


UNIPOLAR OUTPUT
CLOCK
DATA 1
DATA 2
DATA 3
DATA 4
30
J27
(ECL)
J43
J3
J4
J5
(±1V, 0/+2.4V)
(+1V, 0/+2.4V)
(ECL)
J40
J24
J6
J7
Q65-5 (3/15)
R433 510
-5.2V
Q65 HD10101
R386 51
R385 100
R384 100
Q235 2SC1907
Q236 2SC1907
R281 510
Q203 RD2.7E
Q204 RD2.7E
R319 100
R349 75
R350 1K
Q223 2SC2498
Q224 2SC2498
R321 100
R324 150
R282 100
Q244 (8/15)
R320 1K
R322 1K
R323 1K
-12V
+12V
Q225 2SA1161
R352 100
(8/15) R332
C200 0.1
R351 220
R387 1.2K
J26
J42 (ECL)
(±1V, 0/+2.4V)
R434 510
Q66
R279 510
Q66 HD10101
Q72-4 (3/15)
Q201 RD2.7E
Q202 RD2.7E
R313 100
R345 75
R346 1K
Q220 2SC2498
Q221 2SC2498
R315 100
R318 150
R280 100
Q244 (8/15)
R314 1K
R316 1K
R317 1K
Q222 2SA1161
R348 100
R332 (8/15)
R347 220
R388 1.5K
C240 0.1
R435 510
Q66
R277 510
Q72-13 (3/15)
Q199 RD2.7E
Q200 RD2.7E
R307 100
R341 75
R342 1K
Q217 2SC2498
Q218 2SC2498
R309 100
R312 150
R278 100
Q244 (8/15)
R308 1K
R310 1K
R311 1K
(ECL)
(1V, 0/+2.4V)
J25 J41
Q219 2SA1161
R344 100
R332 (8/15)
R343 220
R389 1.5K
Q239 HD10101
R275 510
Q239
Q72-14 (3/15)
R428 510
Q197 RD2.7E
Q198 RD2.7E
R301 100
R337 75
R338 1K
Q214 2SC2498
Q215 2SC2498
R303 100
R306 150
R276 100
Q244 (8/15)
R302 1K
R304 1K
R305 1K
(8/15) R332
Q216 2SA1161
R340 100
C175 0.1
R339 220
R390 1.5K
(ECL)
(±1V, 0/+2.4V)
J23 J39
R273 510
Q239
Q239
Q72-15 (3/15)
R429 510
Q195 RD2.7E
Q196 RD2.7E
R295 100
R333 75
R334 1K
Q211 2SC2498
Q212 2SC2498
R297 100
R300 150
R274 100
Q244 (8/15)
R296 1K
R298 1K
R299 1K
Q213 2SA1161
R336 100
R332 (8/15)
R335 220
R391 1.5K
TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-7/15)

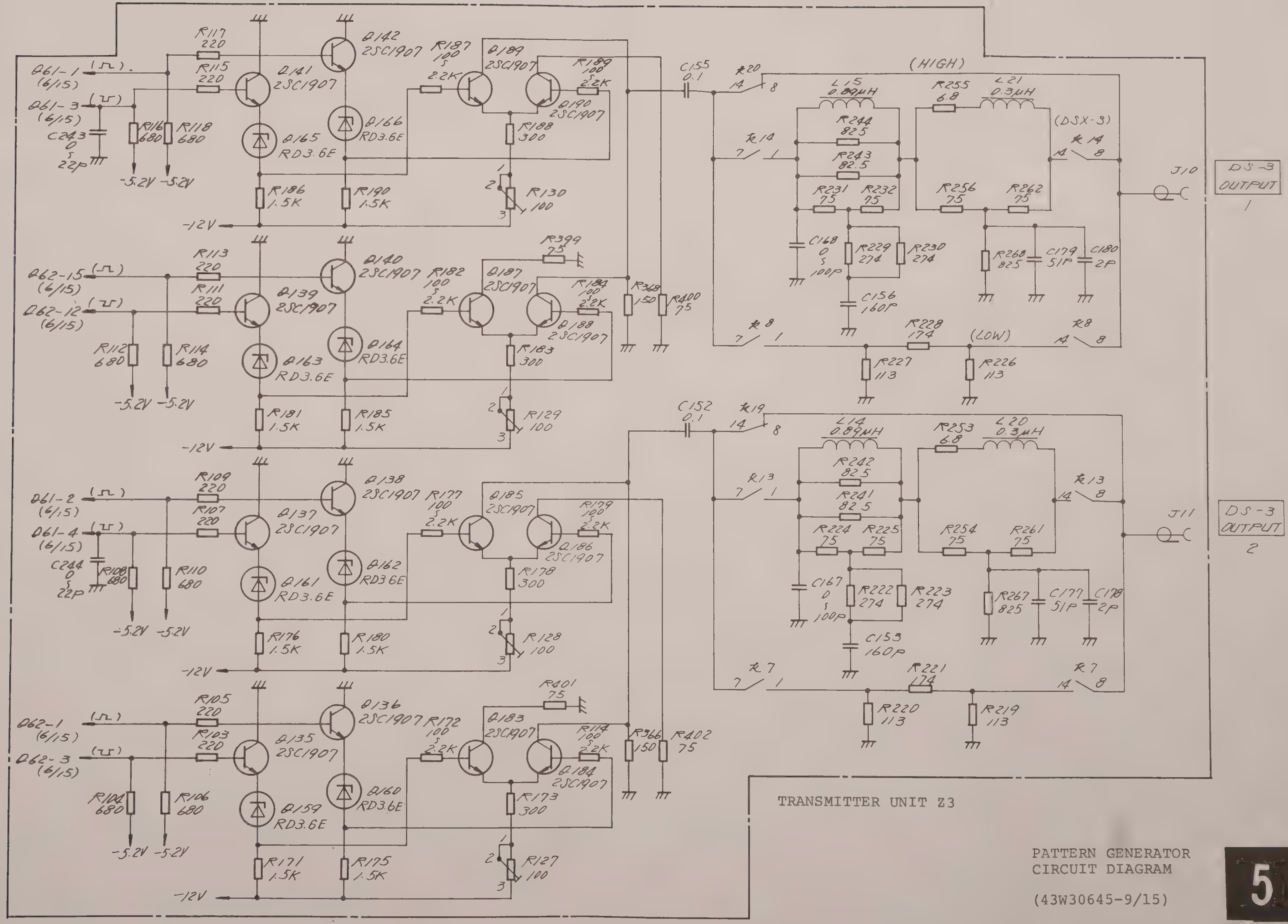
5


DATA 5
J8
(ECL)
(±1V, 0/+2.4V)
J22 J38
-5.2V
R422 130
R424 82
R271 510
-5.2V
Q67
Q193 RD2.7E
Q194 RD2.7E
Q67 HD10101
Q72-2(3/15)
R289 100
Q208 2SC2498
Q209 2SC2498
R329 75
R330 1K
R291 100
R294 150
R272 100
Q244 (8/15)
R290 1K
R293 1K
R292 1K
-12V
Q210 2SA1161
R332 100
R331 220
R397 1.5K
+12V
R270, R272, R274
R276, R278, R280
R282 (7/15)
C272 0.1
C273 0.1
J51 J52 (±1V)
(0/+2.4V)
Q244 2SA1154
R437 2.2K
R438 500
-12V
R336, R340 R344 R348, R352 (7/15) (7/15) (7/15) (7/15) (7/15)
+12V
R393 3.3K
R392 510
C215 0.1
C216 0.1
(0/+2.4V)
(±1V)
R412 2K
R411 2K
(OFF SET)
J21 J37 J9
(ECL)
(±1V, 0/+2.4V)
DATA 6
-5.2V
R423 130
R425 82
R269 510
-5.2V
Q67
Q191 RD2.7E
Q192 RD2.7E
Q67
Q72-3(3/15)
R283 100
Q205 2SC2498
Q206 2SC2498
R325 75
R326 1K
R285 100
R288 150
R270 100
Q244 (8/15)
R284 1K
R287 1K
R286 1K
-12V
Q207 2SA1161
R328 100
R327 220
R398 1.5K
C241 0.1
+12V
+12V C214 0.1
R396 2.2K
C189 0.1
(±1V)
J36 (0/+2.4V)
J35
R395 100
Q237 2SA1154
TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-8/15)

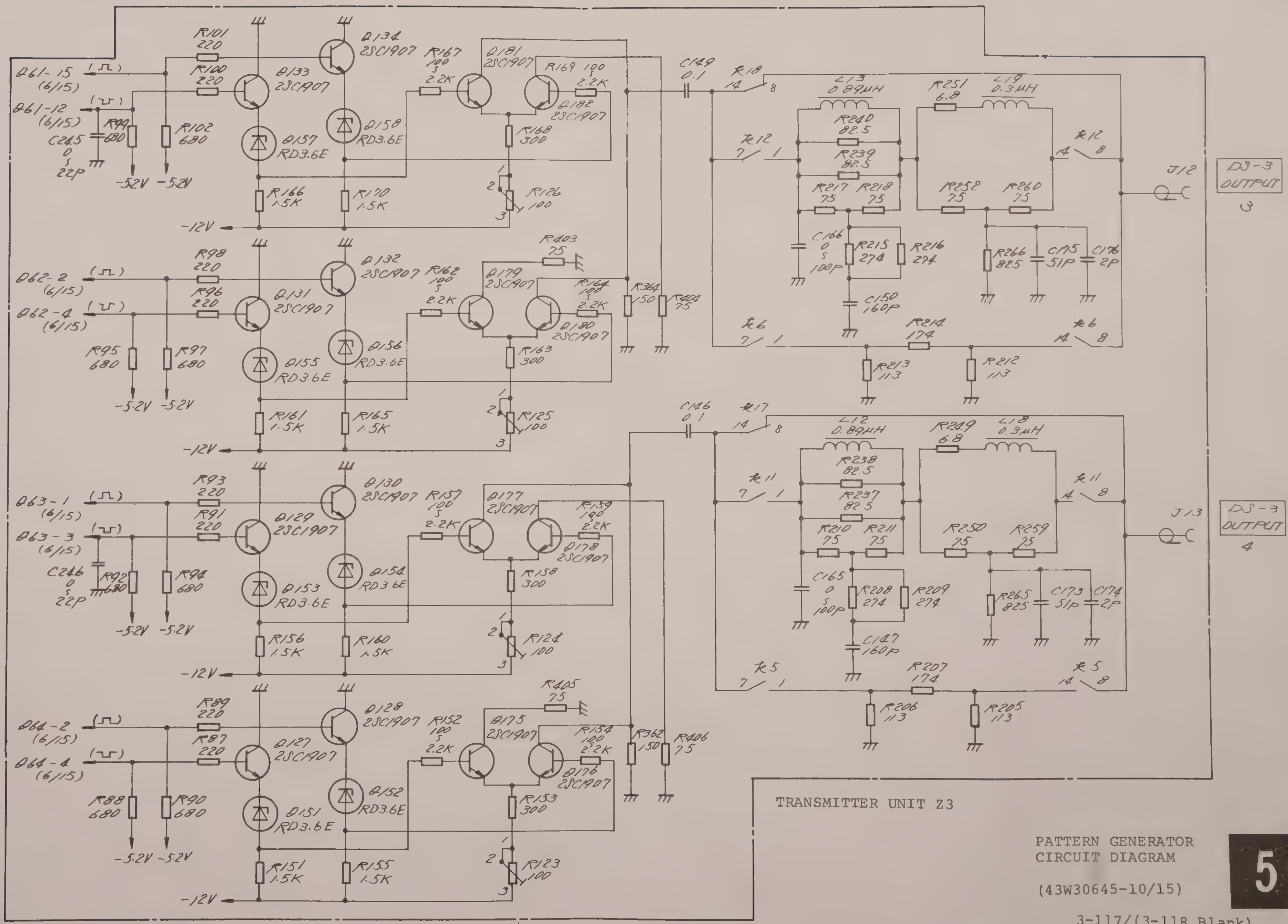
5


Q61-1 (6/15)
Q61-3 (6/15)
C243 0 ~ 22P
R116 680
R118 680
-5.2V
-5.2V
R117 220
R115 220
Q141 2SC1907
Q142 2SC1907
Q165 RD3.6E
Q166 RD3.6E
R186 1.5K
R190 1.5K
-12V
R187 100 ~ 2.2K
Q189 2SC1907
Q190 2SC1907
R189 100 ~ 2.2K
R188 300
R130 100
Q62-15 (6/15)
Q62-12 (6/15)
R112 680
R114 680
R113 220
R111 220
Q139 2SC1907
Q140 2SC1907
Q163 RD3.6E
Q164 RD3.6E
R181 1.5K
R185 1.5K
R182 100 ~ 2.2K
Q187 2SC1907
Q188 2SC1907
R184 100 ~ 2.2K
R183 300
R129 100
R399 75
R368 150
R400 75
Q61-2 (6/15)
Q61-4 (6/15)
C244 0 ~ 22P
R108 680
R110 680
R109 220
R107 220
Q137 2SC1907
Q138 2SC1907
Q161 RD3.6E
Q162 RD3.6E
R176 1.5K
R180 1.5K
R177 100 ~ 2.2K
Q185 2SC1907
Q186 2SC1907
R179 100 ~ 2.2K
R178 300
R128 100
Q62-1 (6/15)
Q62-3 (6/15)
R104 680
R106 680
R105 220
R103 220
Q135 2SC1907
Q136 2SC1907
Q159 RD3.6E
Q160 RD3.6E
R171 1.5K
R175 1.5K
R172 100 ~ 2.2K
Q183 2SC1907
Q184 2SC1907
R174 100 ~ 2.2K
R173 300
R127 100
R401 75
R366 150
R402 75
C155 0.1
K20
K14
K8
(HIGH)
(LOW)
(DSX-3)
L15 0.89μH
L21 0.3μH
R255 6.8
R244 82.5
R243 82.5
R231 75
R232 75
R256 75
R262 75
C168 0 ~ 100P
R229 274
R230 274
C156 160P
R268 825
C179 51P
C180 2P
R228 174
R227 113
R226 113
J10
DS-3 OUTPUT 1
C152 0.1
K19
K13
K7
L14 0.89μH
L20 0.3μH
R253 6.8
R242 82.5
R241 82.5
R224 75
R225 75
R254 75
R261 75
C167 0 ~ 100P
R222 274
R223 274
C153 160P
R267 825
C177 51P
C178 2P
R221 174
R220 113
R219 113
J11
DS-3 OUTPUT 2
TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-9/15)

5

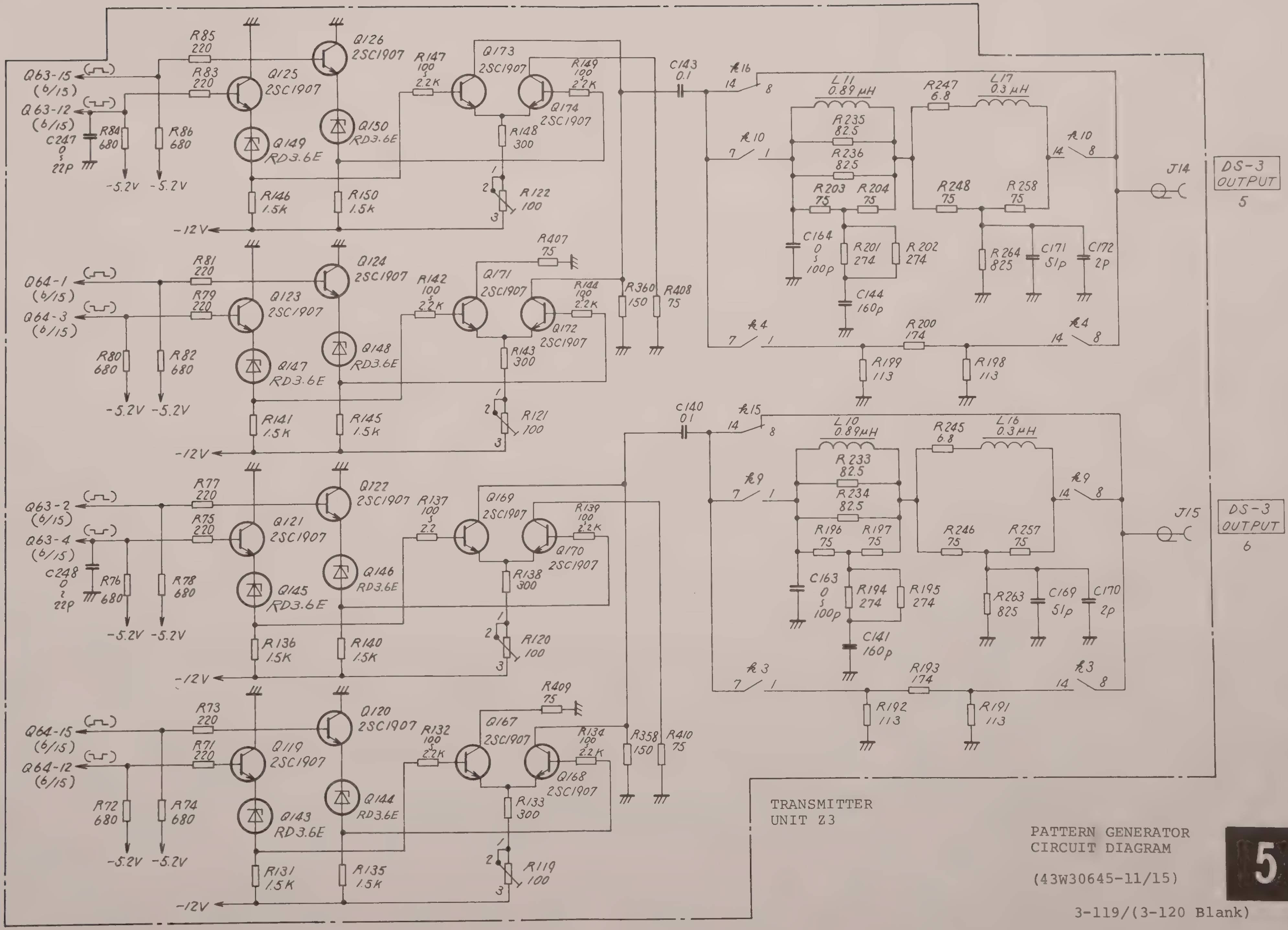

Q61-15 (6/15)
Q61-12 (6/15)
Q62-2 (6/15)
Q62-4 (6/15)
Q63-1 (6/15)
Q63-3 (6/15)
Q64-2 (6/15)
Q64-4 (6/15)
R101 220
R100 220
R99 680
R102 680
C245 0 ~ 22P
-5.2V
Q133 2SC1907
Q134 2SC1907
Q157 RD3.6E
Q158 RD3.6E
R166 1.5K
R170 1.5K
R167 100 ~ 2.2K
Q181 2SC1907
Q182 2SC1907
R169 100 ~ 2.2K
R168 300
R126 100
-12V
R98 220
R96 220
R95 680
R97 680
Q131 2SC1907
Q132 2SC1907
Q155 RD3.6E
Q156 RD3.6E
R162 100 ~ 2.2K
Q179 2SC1907
Q180 2SC1907
R164 100 ~ 2.2K
R403 75
R364 150
R404 75
R163 300
R161 1.5K
R165 1.5K
R125 100
R93 220
R91 220
C246 0 ~ 22P
R92 680
R94 680
Q129 2SC1907
Q130 2SC1907
Q153 RD3.6E
Q154 RD3.6E
R157 100 ~ 2.2K
Q177 2SC1907
Q178 2SC1907
R159 100 ~ 2.2K
R158 300
R156 1.5K
R160 1.5K
R124 100
R89 220
R87 220
R88 680
R90 680
Q127 2SC1907
Q128 2SC1907
Q151 RD3.6E
Q152 RD3.6E
R152 100 ~ 2.2K
Q175 2SC1907
Q176 2SC1907
R154 100 ~ 2.2K
R405 75
R362 150
R406 75
R153 300
R151 1.5K
R155 1.5K
R123 100
C149 0.1
K18
L13 0.89μH
R240 82.5
R239 82.5
R217 75
R218 75
R251 6.8
L19 0.3μH
R252 75
R260 75
K12
C166 0 ~ 100P
R215 274
R216 274
C150 160P
R266 825
C175 51P
C176 2P
K6
R214 174
R213 113
R212 113
J12
DS-3 OUTPUT 3
C146 0.1
K17
L12 0.89μH
R238 82.5
R237 82.5
R210 75
R211 75
R249 6.8
L18 0.3μH
R250 75
R259 75
K11
C165 0 ~ 100P
R208 274
R209 274
C147 160P
R265 825
C173 51P
C174 2P
K5
R207 174
R206 113
R205 113
J13
DS-3 OUTPUT 4

TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-10/15)

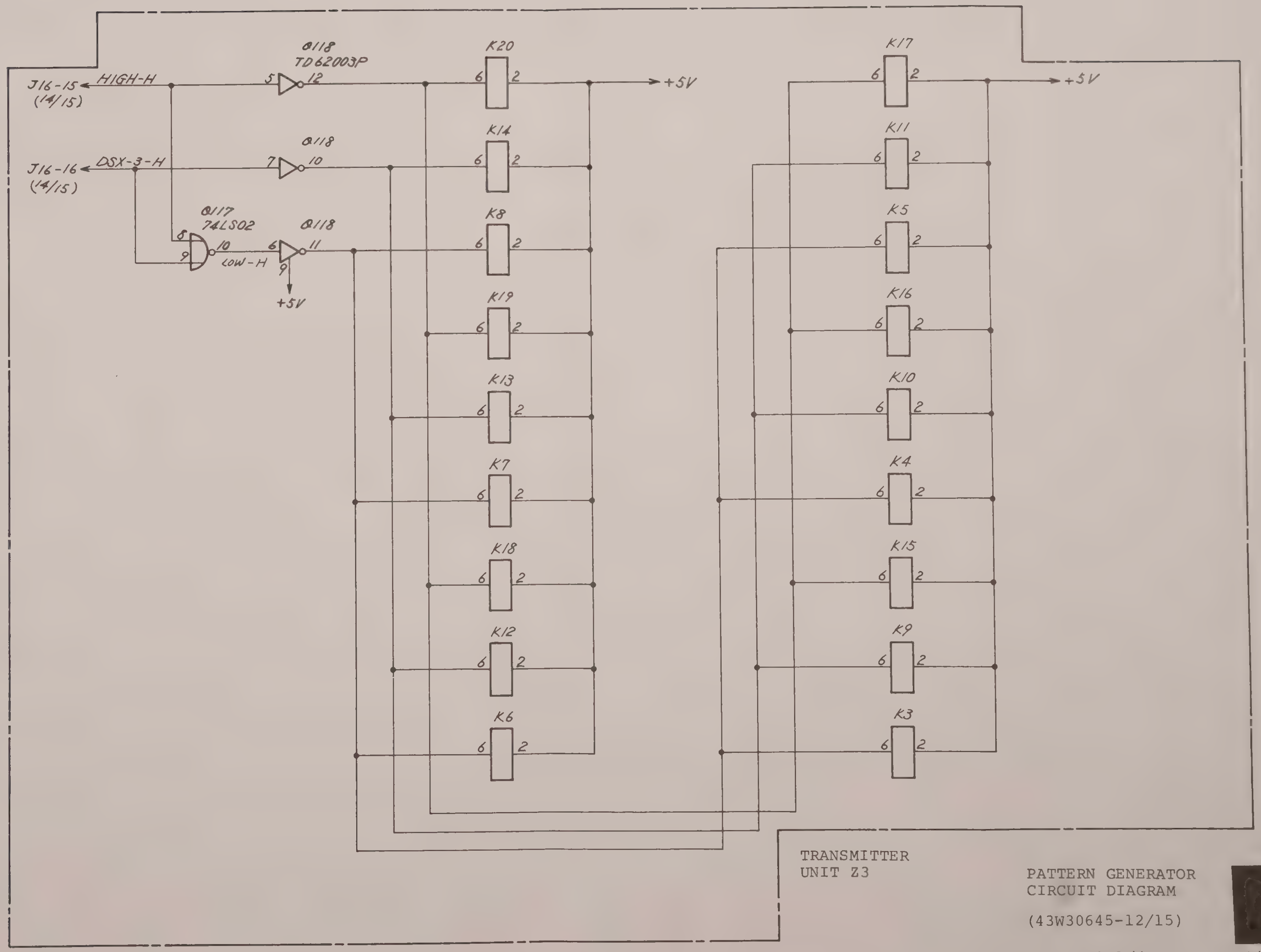
5


Q63-15 (6/15)
Q63-12 (6/15)
C247 0 ~ 22P
R84 680
R85 220
R83 220
R86 680
-5.2V
-5.2V
Q125 2SC1907
Q126 2SC1907
Q149 RD3.6E
Q150 RD3.6E
R146 1.5k
R150 1.5k
-12V
R147 100 ~ 2.2K
Q173 2SC1907
Q174 2SC1907
R149 100 ~ 2.2K
R148 300
R122 100
C143 0.1
K16
K10
L11 0.89μH
R235 82.5
R236 82.5
R203 75
R204 75
C164 0 ~ 100p
R201 274
R202 274
C144 160p
R247 6.8
L17 0.3μH
R248 75
R258 75
R264 825
C171 51p
C172 2p
J14
DS-3 OUTPUT 5
K4
R200 174
R199 113
R198 113
Q64-1 (6/15)
Q64-3 (6/15)
R81 220
R79 220
R80 680
R82 680
Q123 2SC1907
Q124 2SC1907
Q147 RD3.6E
Q148 RD3.6E
R141 1.5K
R145 1.5K
R142 100 ~ 2.2K
Q171 2SC1907
Q172 2SC1907
R144 100 ~ 2.2K
R407 75
R143 300
R121 100
R360 150
R408 75
C140 0.1
K15
L10 0.89μH
R233 82.5
R234 82.5
R196 75
R197 75
C163 0 ~ 100p
R194 274
R195 274
C141 160p
R245 6.8
L16 0.3μH
K9
R246 75
R257 75
R263 825
C169 51p
C170 2p
J15
DS-3 OUTPUT 6
K3
R193 174
R192 113
R191 113
Q63-2 (6/15)
Q63-4 (6/15)
C248 0 ~ 22p
R77 220
R75 220
R76 680
R78 680
Q121 2SC1907
Q122 2SC1907
Q145 RD3.6E
Q146 RD3.6E
R136 1.5K
R140 1.5K
R137 100 ~ 2.2
Q169 2SC1907
Q170 2SC1907
R139 100 ~ 2.2K
R138 300
R120 100
Q64-15 (6/15)
Q64-12 (6/15)
R73 220
R71 220
R72 680
R74 680
Q119 2SC1907
Q120 2SC1907
Q143 RD3.6E
Q144 RD3.6E
R131 1.5K
R135 1.5k
R132 100 ~ 2.2K
Q167 2SC1907
Q168 2SC1907
R134 100 ~ 2.2K
R409 75
R133 300
R119 100
R358 150
R410 75
TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-11/15)

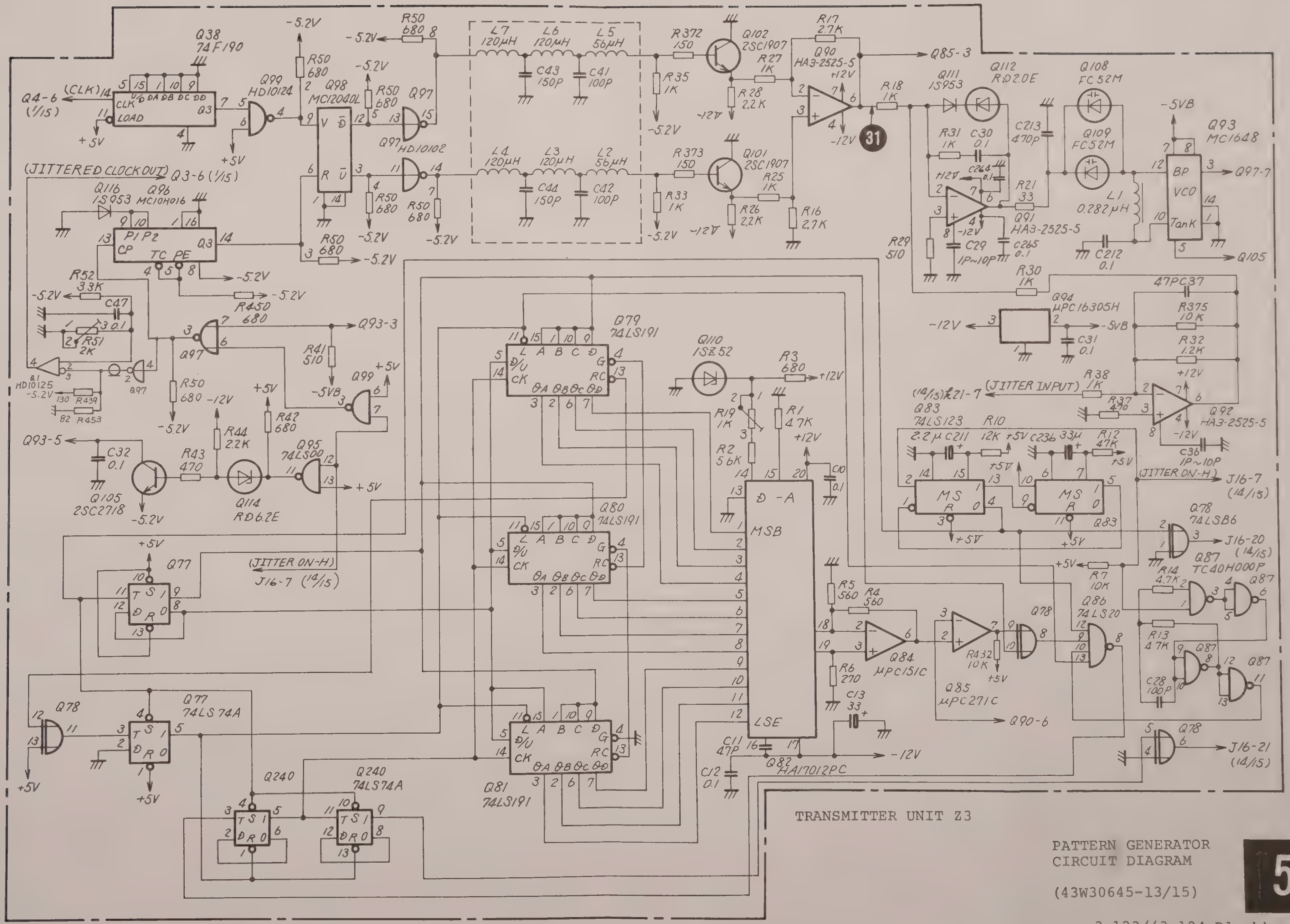
5


J16-15
(14/15)
HIGH-H
Q118
TD62003P
5
12
J16-16
(14/15)
DSX-3-H
Q118
7
10
Q117
74LS02
8
9
10
LOW-H
Q118
6
11
9
+5V
K20
K14
K8
K19
K13
K7
K18
K12
K6
K17
K11
K5
K16
K10
K4
K15
K9
K3
6
2
+5V
+5V
TRANSMITTER
UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-12/15)

5

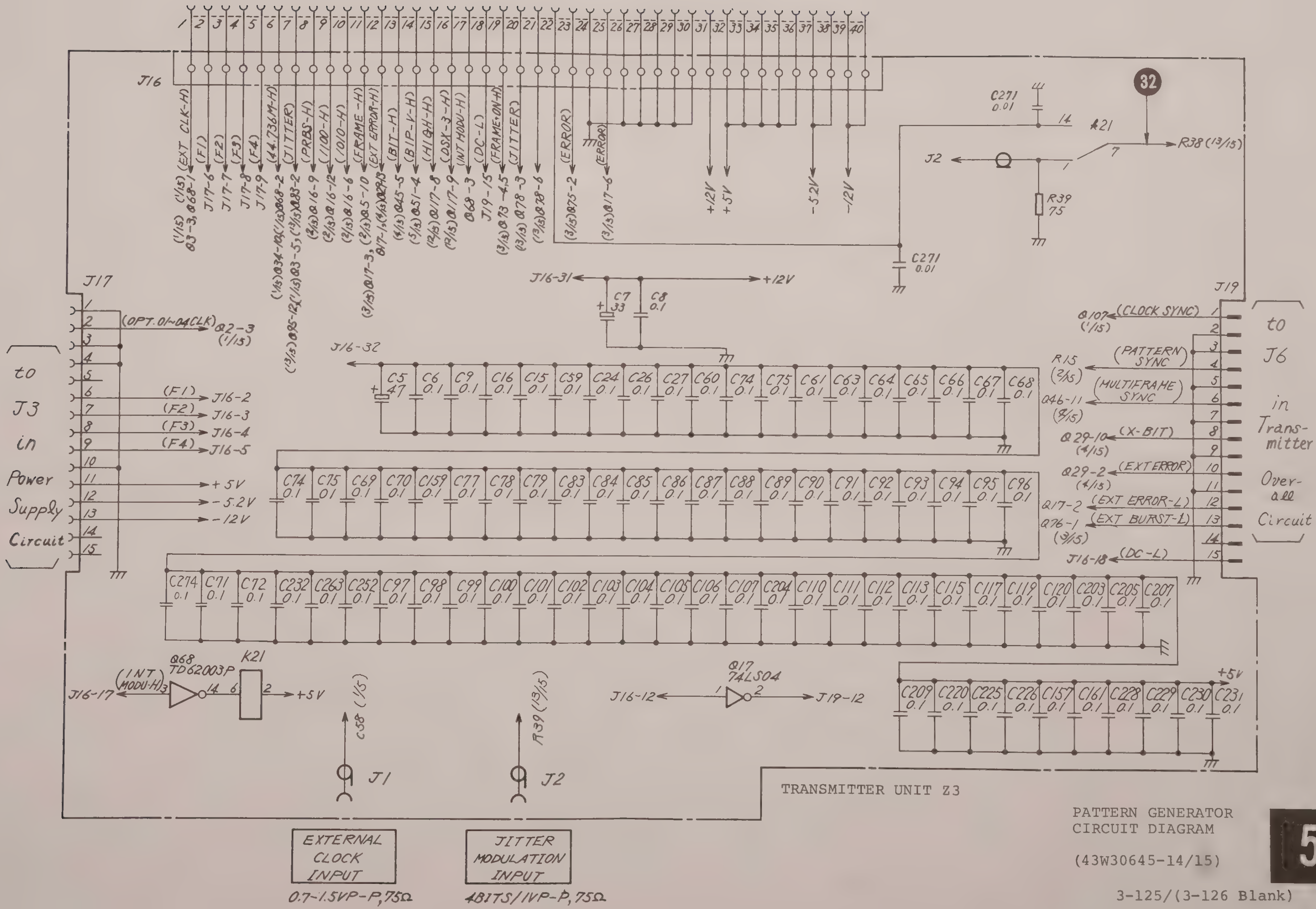

Q38 74F190
Q4-6 (1/15)
(CLK)
CLK
LOAD
+5V
Q99 HD10124
Q98 MC12040L
Q97 HD10102
R50 680
-5.2V
L7 120μH
L6 120μH
L5 56μH
C43 150P
C41 100P
L4 120μH
L3 120μH
L2 56μH
C44 150P
C42 100P
R372 150
R373 150
R35 1K
R33 1K
Q102 2SC1907
Q101 2SC1907
R27 1K
R28 2.2K
R25 1K
R26 2.2K
R16 2.7K
R17 2.7K
Q90 HA3-2525-5
Q85-3
-12V
+12V
31
R18 1K
Q111 1S953
Q112 RD2.0E
Q108 FC52M
Q109 FC52M
R31 1K
C30 0.1
C264 0.1
C213 470P
R21 33
Q91 HA3-2525-5
C29 1P~10P
C265 0.1
R29 510
L1 0.282μH
C212 0.1
-5VB
Q93 MC1648
BP
VCO
Tank
Q97-7
Q105
(JITTERED CLOCK OUT) Q3-6 (1/15)
Q116 1S953
Q96 MC10H016
P1 P2
CP
TC PE
Q3
R52 3.3K
C47 0.1
R51 2K
R450 680
Q93-3
R41 510
-5VB
HD10125
R439 130
R453 82
Q97
R50 680
Q99
Q93-5
C32 0.1
Q105 2SC2718
R43 470
R44 2.2K
Q114 RD6.2E
R42 680
Q95 74LS00
(JITTER ON-H)
J16-7 (14/15)
Q77
T S
D R
Q78
Q77 74LS74A
Q240
Q240 74LS74A
Q79 74LS191
Q80 74LS191
Q81 74LS191
L A B C D
D/U
CK
G
RC
QA QB QC QD
Q110 1SZ52
R3 680
R19 1K
R1 4.7K
R2 5.6K
C10 0.1
D-A
MSB
LSE
C11 47P
C12 0.1
Q82 HA17012PC
C13 33
R5 560
R4 560
R6 270
Q84 μPC151C
Q85 μPC271C
R432 10K
Q78
Q90-6
R30 1K
Q94 μPC16305H
C31 0.1
47P C37
R375 10K
R32 1.2K
R38 1K
R37 470
(14/15) K21-7
(JITTER INPUT)
Q92 HA3-2525-5
C36 1P~10P
Q83 74LS123
2.2μ C211
R10 12K
C236 33μ
R12 47K
MS
(JITTER ON-H)
J16-7 (14/15)
Q78 74LS86
J16-20 (14/15)
Q87 TC40H000P
R14 4.7K
R7 10K
Q86 74LS20
R13 4.7K
C28 100P
J16-21 (14/15)

TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-13/15)

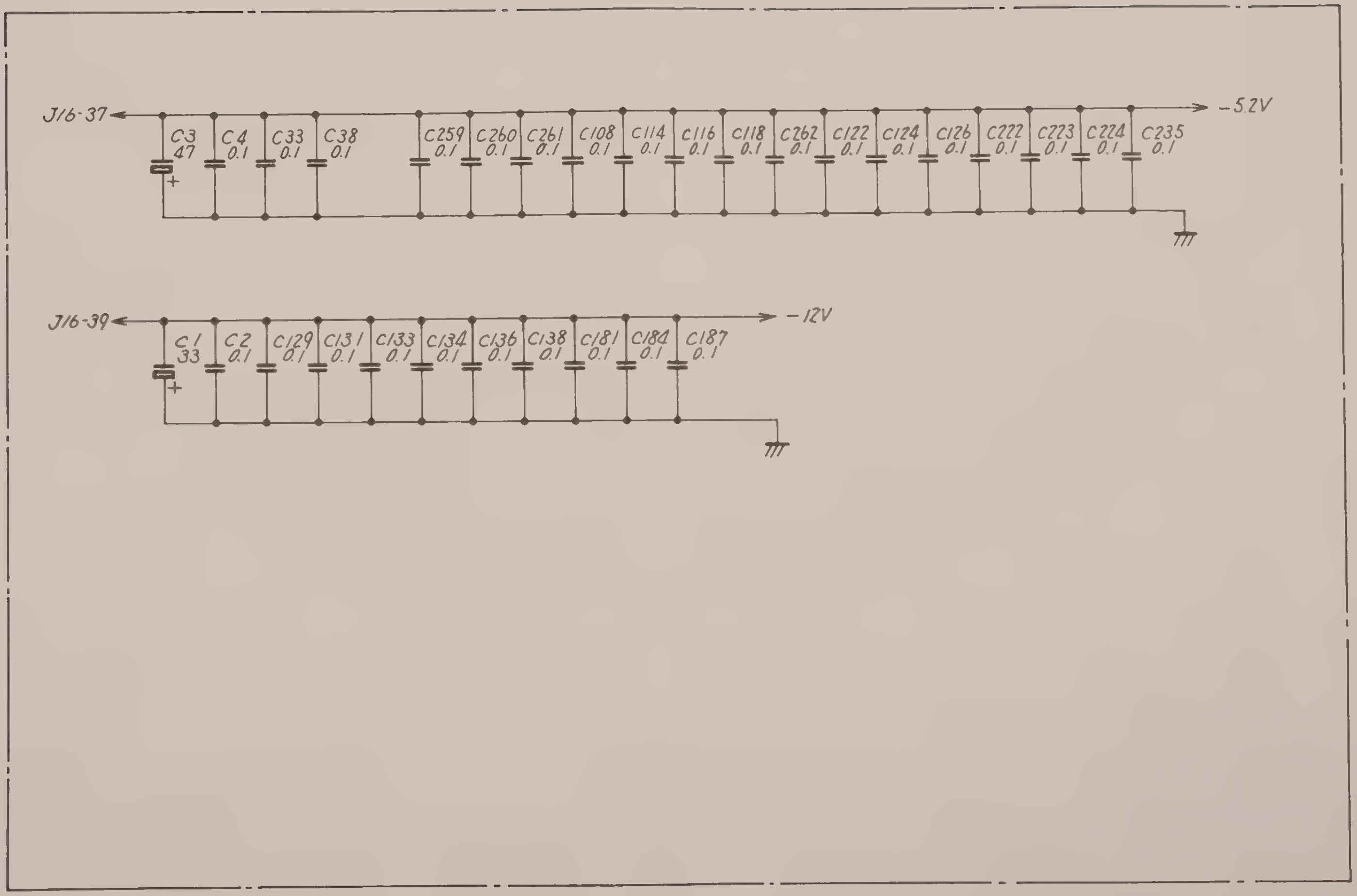
5


J16
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
(EXT CLK-H) (1/15) (1/15) Q3-3, Q68-1
(F1) J17-6
(F2) J17-7
(F3) J17-8
(F4) J17-9
(44.736M-H) (1/15)Q34-10,(1/15)Q68-2
(JITTER) (3/15)Q95-12,(1/15)Q3-5,(13/15)Q3-2
(PRBS-H) (2/15)Q16-9
(1100-H) (2/15)Q16-12
(1010-H) (2/15)Q16-6
(FRAME-H) (2/15)Q5-10
(EXT ERROR-H) (3/15)Q17-3, Q17-1,(4/15)Q29-13
(BIT-H) (4/15)Q45-5
(BIP-V-H) (5/15)Q51-4
(HIGH-H) (12/15)Q17-8
(OSK-3-H) (9/15)Q17-9
(INT MODU-H) Q69-3
(DC-L) J19-15
(FRAME-ON-H) (3/15)Q73-4,5
(JITTER) (3/15)Q78-3
(13/15)Q28-6
(ERROR) (3/15)Q75-2
(ERROR) (3/15)Q17-6
+12V
+5V
-5.2V
-12V
C271 0.01
14
Q21
7
1
32
R38 (13/15)
J2
R39 75
C271 0.01
J16-31
+12V
C7 33
C8 0.1
J16-32
C5 47
C6 0.1
C9 0.1
C16 0.1
C15 0.1
C59 0.1
C24 0.1
C26 0.1
C27 0.1
C60 0.1
C74 0.1
C75 0.1
C61 0.1
C63 0.1
C64 0.1
C65 0.1
C66 0.1
C67 0.1
C68 0.1
C74 0.1
C75 0.1
C69 0.1
C70 0.1
C159 0.1
C77 0.1
C78 0.1
C79 0.1
C83 0.1
C84 0.1
C85 0.1
C86 0.1
C87 0.1
C88 0.1
C89 0.1
C90 0.1
C91 0.1
C92 0.1
C93 0.1
C94 0.1
C95 0.1
C96 0.1
C274 0.1
C71 0.1
C72 0.1
C232 0.1
C263 0.1
C252 0.1
C97 0.1
C98 0.1
C99 0.1
C100 0.1
C101 0.1
C102 0.1
C103 0.1
C104 0.1
C105 0.1
C106 0.1
C107 0.1
C204 0.1
C110 0.1
C111 0.1
C112 0.1
C113 0.1
C115 0.1
C117 0.1
C119 0.1
C120 0.1
C203 0.1
C205 0.1
C207 0.1
C209 0.1
C220 0.1
C225 0.1
C226 0.1
C157 0.1
C161 0.1
C228 0.1
C229 0.1
C230 0.1
C231 0.1
+5V
J17
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
(OPT.01~04CLK) Q2-3 (1/15)
(F1) J16-2
(F2) J16-3
(F3) J16-4
(F4) J16-5
+5V
-5.2V
-12V
to J3 in Power Supply Circuit
J19
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Q107 (1/15) (CLOCK SYNC)
R15 (2/15) (PATTERN SYNC)
Q46-11 (8/15) (MULTIFRAME SYNC)
Q29-10 (4/15) (X-BIT)
Q29-2 (4/15) (EXT ERROR)
Q17-2 (EXT ERROR-L)
Q76-1 (9/15) (EXT BURST-L)
J16-18 (DC-L)
to J6 in Transmitter Over-all Circuit
Q68 TD62003P
J16-17 (INT MODU-H) 3 14
K21 6 2 +5V
C58 (1/15)
R39 (13/15)
J1
J2
Q17 74LS04
J16-12 1 2 J19-12
TRANSMITTER UNIT Z3
EXTERNAL CLOCK INPUT
0.7-1.5VP-P,75Ω
JITTER MODULATION INPUT
4BITS/1VP-P,75Ω

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-14/15)

5

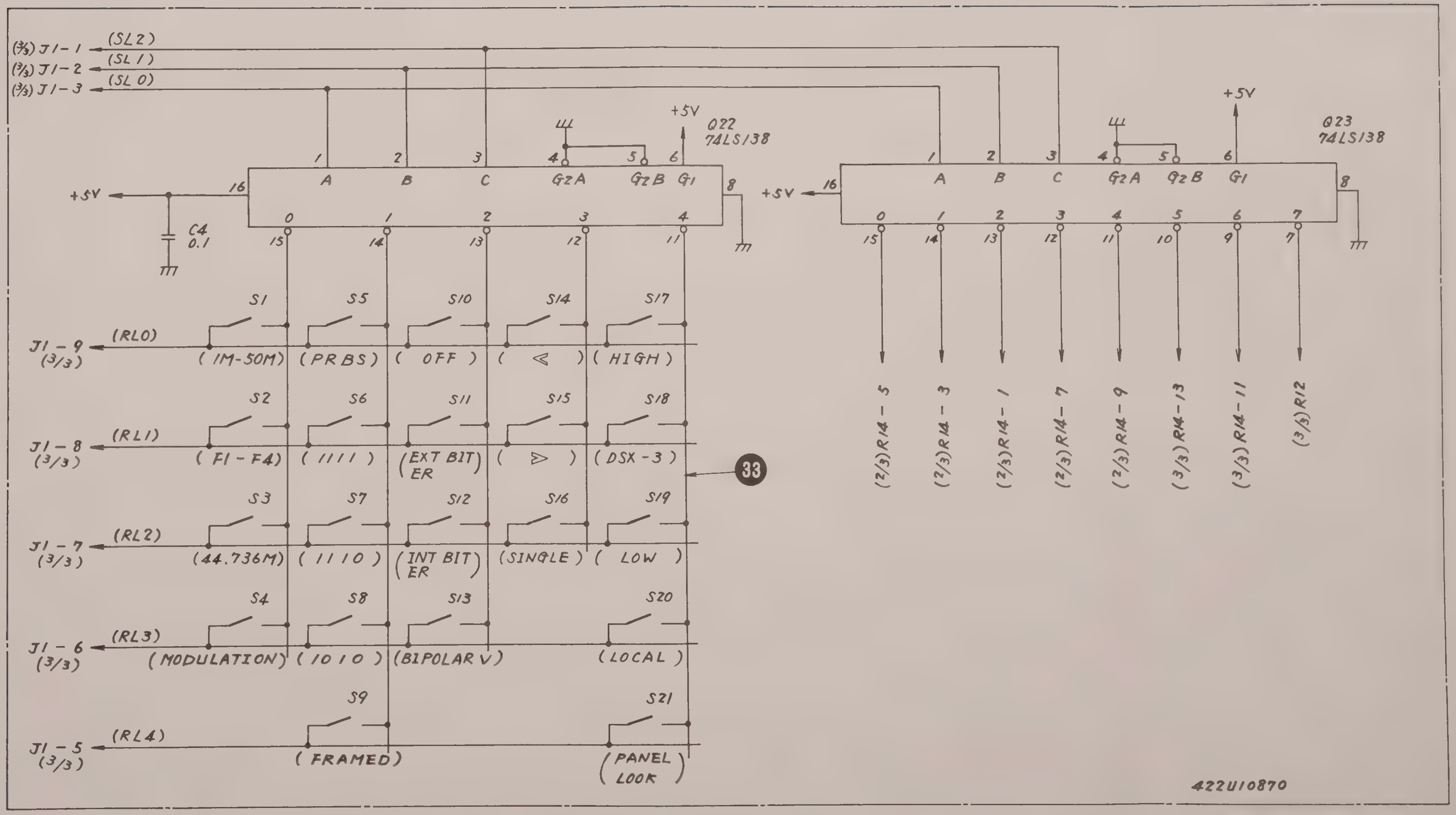

J16-37
-5.2V
C3 47
C4 0.1
C33 0.1
C38 0.1
C259 0.1
C260 0.1
C261 0.1
C108 0.1
C114 0.1
C116 0.1
C118 0.1
C262 0.1
C122 0.1
C124 0.1
C126 0.1
C222 0.1
C223 0.1
C224 0.1
C235 0.1
J16-39
-12V
C1 33
C2 0.1
C129 0.1
C131 0.1
C133 0.1
C134 0.1
C136 0.1
C138 0.1
C181 0.1
C184 0.1
C187 0.1
+
+

TRANSMITTER UNIT Z3

PATTERN GENERATOR
CIRCUIT DIAGRAM

(43W30645-15/15)

5


(3/3) J1-1 (SL2)
(3/3) J1-2 (SL1)
(3/3) J1-3 (SL0)
Q22 74LS138
Q23 74LS138
+5V
C4 0.1
A B C G2A G2B G1
J1-9 (3/3) (RL0)
J1-8 (3/3) (RL1)
J1-7 (3/3) (RL2)
J1-6 (3/3) (RL3)
J1-5 (3/3) (RL4)
S1 (1M-50M)
S5 (PRBS)
S10 (OFF)
S14 (<)
S17 (HIGH)
S2 (F1-F4)
S6 (1111)
S11 (EXT BIT ER)
S15 (>)
S18 (DSX-3)
S3 (44.736M)
S7 (1110)
S12 (INT BIT ER)
S16 (SINGLE)
S19 (LOW)
S4 (MODULATION)
S8 (1010)
S13 (BIPOLAR V)
S20 (LOCAL)
S9 (FRAMED)
S21 (PANEL LOOK)
33
(2/3) R14-5
(2/3) R14-3
(2/3) R14-1
(2/3) R14-7
(2/3) R14-9
(3/3) R14-13
(3/3) R14-11
(3/3) R12
422U10870

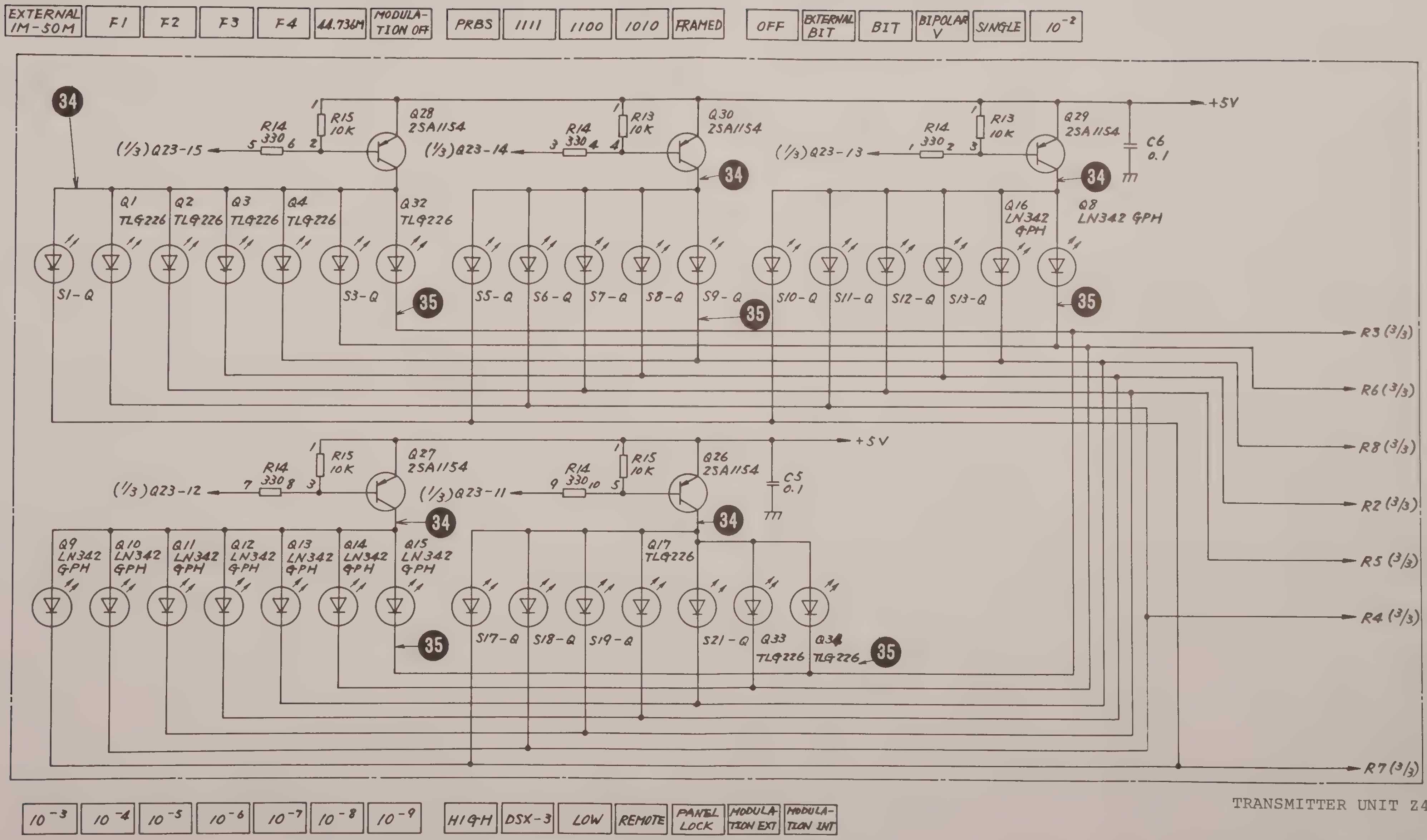
Component List (Table 4-4)

TRANSMITTER UNIT Z4

FRONT PANEL CIRCUIT
CIRCUIT DIAGRAM

(43W30646-1/3)

6

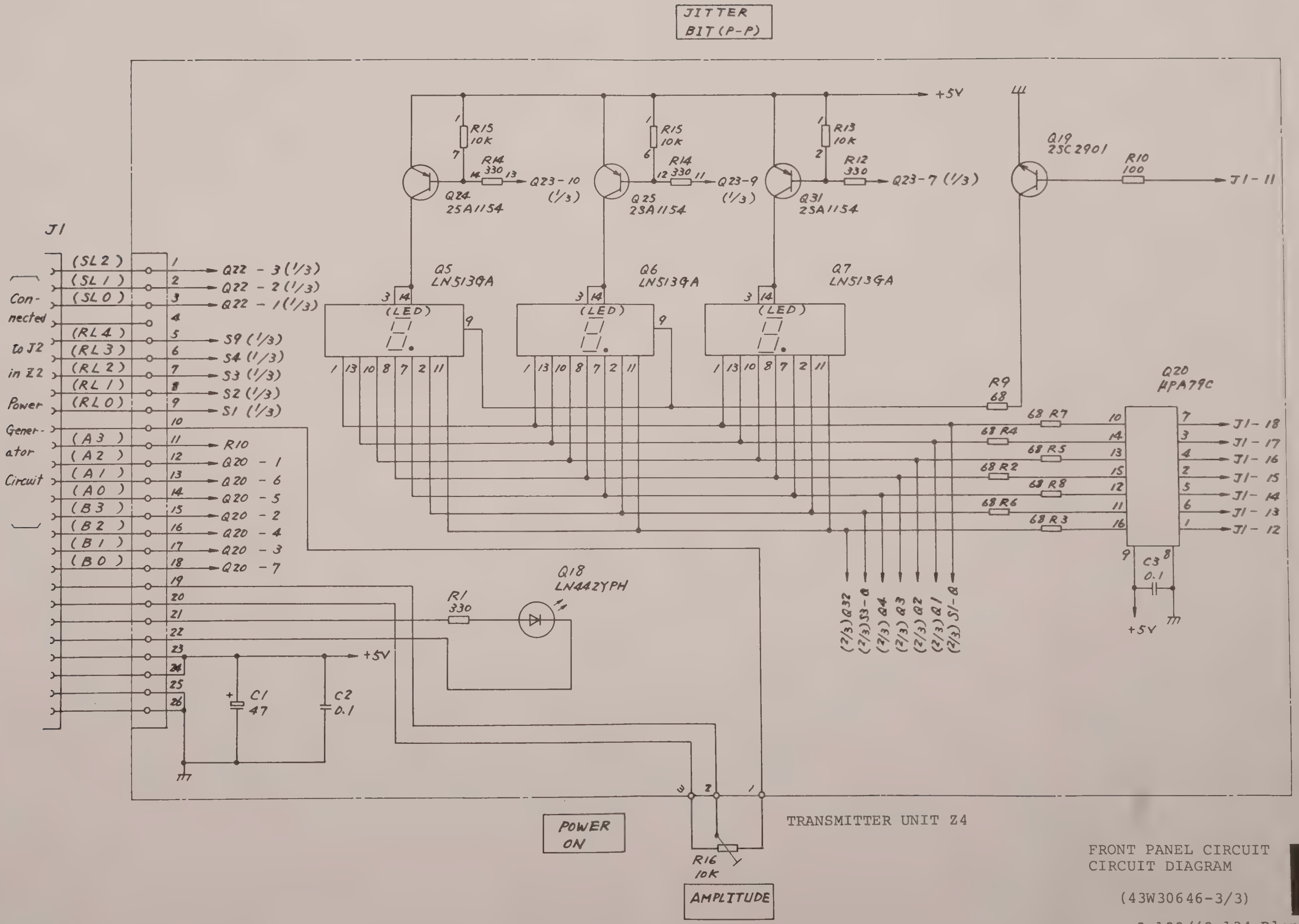

EXTERNAL 1M-50M
F1
F2
F3
F4
44.736M
MODULATION OFF
PRBS
1111
1100
1010
FRAMED
OFF
EXTERNAL BIT
BIT
BIPOLAR V
SINGLE
10^-2
34
35
R14 330
R15 10K
R13 10K
Q28 2SA1154
Q30 2SA1154
Q29 2SA1154
Q27 2SA1154
Q26 2SA1154
(1/3)Q23-15
(1/3)Q23-14
(1/3)Q23-13
(1/3)Q23-12
(1/3)Q23-11
C6 0.1
C5 0.1
+5V
Q1 TLG226
Q2 TLG226
Q3 TLG226
Q4 TLG226
Q32 TLG226
Q16 LN342 GPH
Q8 LN342 GPH
Q9 LN342 GPH
Q10 LN342 GPH
Q11 LN342 GPH
Q12 LN342 GPH
Q13 LN342 GPH
Q14 LN342 GPH
Q15 LN342 GPH
Q17 TLG226
Q33 TLG226
Q34 TLG226
S1-Q
S3-Q
S5-Q
S6-Q
S7-Q
S8-Q
S9-Q
S10-Q
S11-Q
S12-Q
S13-Q
S17-Q
S18-Q
S19-Q
S21-Q
R3 (3/3)
R6 (3/3)
R8 (3/3)
R2 (3/3)
R5 (3/3)
R4 (3/3)
R7 (3/3)
10^-3
10^-4
10^-5
10^-6
10^-7
10^-8
10^-9
HIGH
DSX-3
LOW
REMOTE
PANEL LOCK
MODULATION EXT
MODULATION INT

TRANSMITTER UNIT Z4

FRONT PANEL CIRCUIT
CIRCUIT DIAGRAM

(43W30646-2/3)

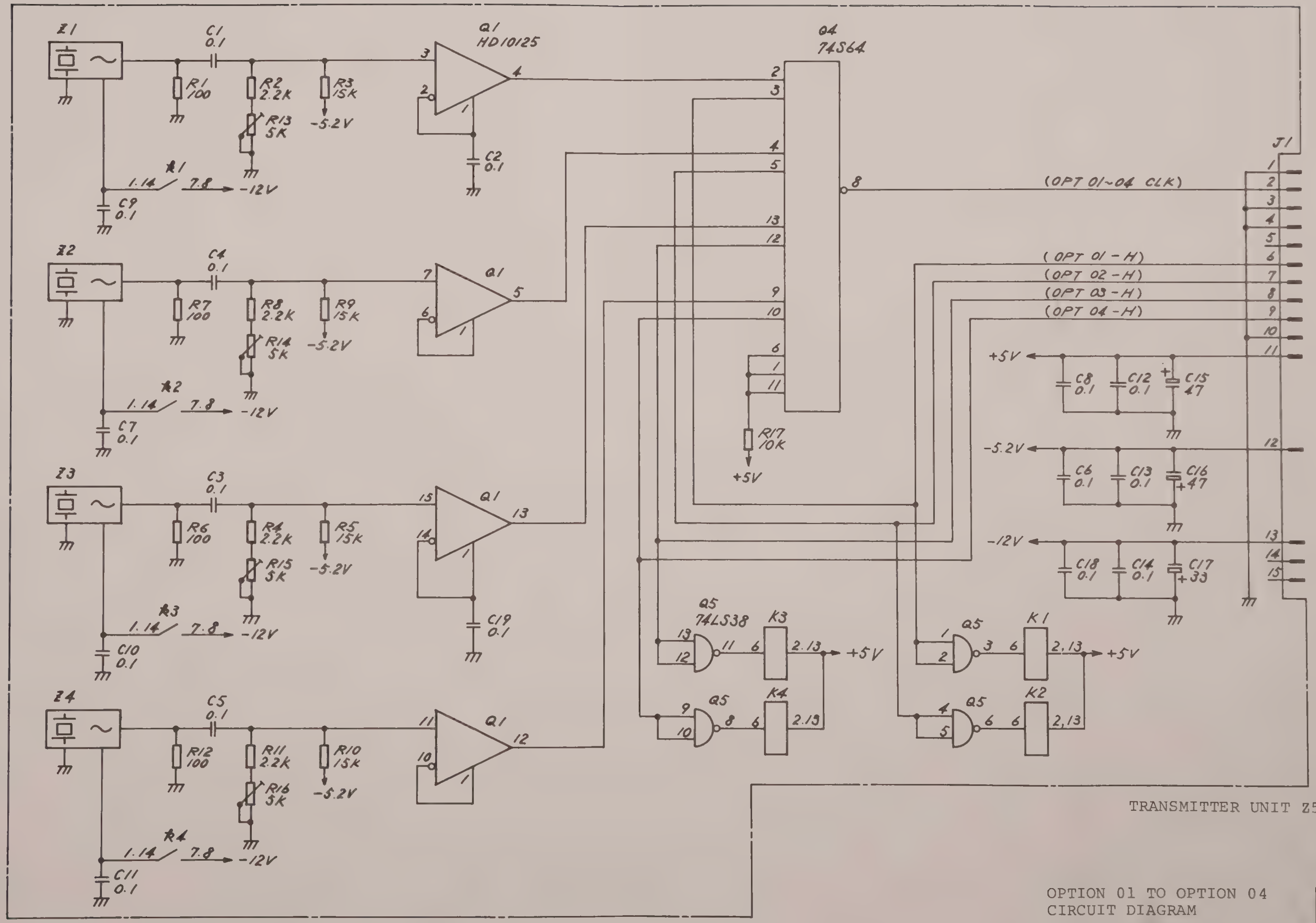
6


JITTER BIT (P-P)
+5V
R15 10k
R14 330
Q23-10 (1/3)
Q24 2SA1154
R15 10k
R14 330
Q23-9 (1/3)
Q25 2SA1154
R13 10k
R12 330
Q23-7 (1/3)
Q31 2SA1154
Q19 2SC2901
R10 100
J1-11
J1
Connected to J2 in Z2 Power Generator Circuit
(SL2)
(SL1)
(SL0)
(RL4)
(RL3)
(RL2)
(RL1)
(RL0)
(A3)
(A2)
(A1)
(A0)
(B3)
(B2)
(B1)
(B0)
Q22 - 3 (1/3)
Q22 - 2 (1/3)
Q22 - 1 (1/3)
S9 (1/3)
S4 (1/3)
S3 (1/3)
S2 (1/3)
S1 (1/3)
R10
Q20 - 1
Q20 - 6
Q20 - 5
Q20 - 2
Q20 - 4
Q20 - 3
Q20 - 7
Q5 LN513GA
Q6 LN513GA
Q7 LN513GA
(LED)
R9 68
Q20 μPA79C
68 R7
68 R4
68 R5
68 R2
68 R8
68 R6
68 R3
J1-18
J1-17
J1-16
J1-15
J1-14
J1-13
J1-12
C3 0.1
+5V
(2/3) Q32
(2/3) S3-8
(2/3) Q4
(2/3) Q3
(2/3) Q2
(2/3) Q1
(2/3) S1-8
Q18 LN442YPH
R1 330
+5V
C1 47
C2 0.1
R16 10k
POWER ON
AMPLITUDE
TRANSMITTER UNIT Z4

FRONT PANEL CIRCUIT
CIRCUIT DIAGRAM

(43W30646-3/3)

6


Z1
Z2
Z3
Z4
C1 0.1
C4 0.1
C3 0.1
C5 0.1
R1 100
R7 100
R6 100
R12 100
R2 2.2k
R8 2.2k
R4 2.2k
R11 2.2k
R13 5K
R14 5K
R15 5K
R16 5K
R3 15k
R9 15k
R5 15k
R10 15k
-5.2V
C2 0.1
C19 0.1
C9 0.1
C7 0.1
C10 0.1
C11 0.1
K1
K2
K3
K4
1.14
7.8
-12V
Q1 HD10125
Q1
Q4 74S64
R17 10k
+5V
J1
(OPT 01~04 CLK)
(OPT 01-H)
(OPT 02-H)
(OPT 03-H)
(OPT 04-H)
+5V
C8 0.1
C12 0.1
C15 47
-5.2V
C6 0.1
C13 0.1
C16 47
-12V
C18 0.1
C14 0.1
C17 33
Q5 74LS38
Q5
K3
K4
K1
K2
2.13
+5V

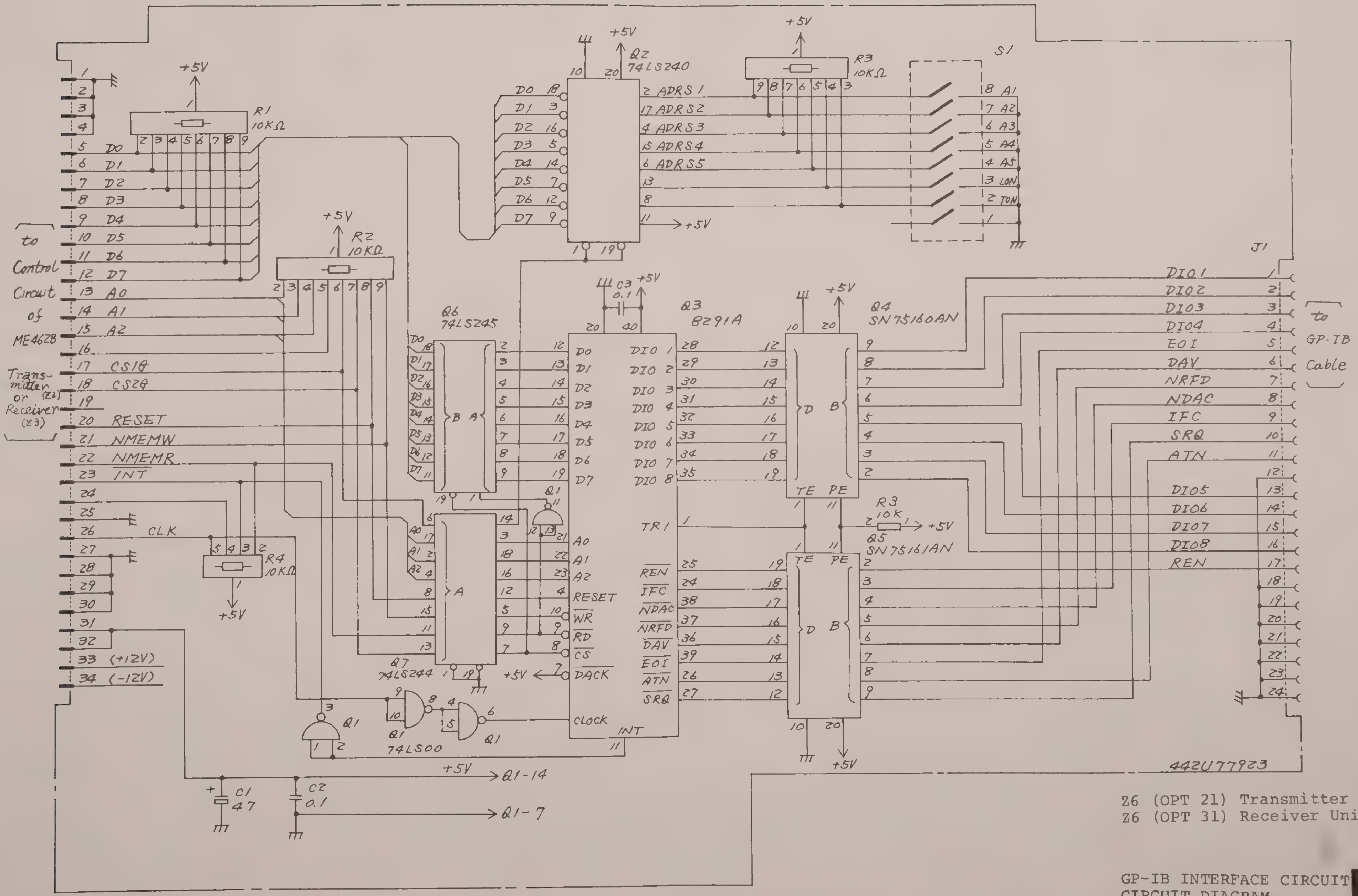
TRANSMITTER UNIT Z5

Component List (Table 4-5)

OPTION 01 TO OPTION 04
CIRCUIT DIAGRAM

(43W32137-1/1)

7


to Control Circuit of ME462B
Trans-mitter (Z2) or Receiver (Z3)
1
2
3
4
5 D0
6 D1
7 D2
8 D3
9 D4
10 D5
11 D6
12 D7
13 A0
14 A1
15 A2
16
17 CS1Ø
18 CS2Ø
19
20 RESET
21 NMEMW
22 NMEMR
23 INT
24
25
26 CLK
27
28
29
30
31
32
33 (+12V)
34 (-12V)
+5V
R1 10KΩ
R2 10KΩ
R3 10KΩ
R4 10KΩ
Q2 74LS240
ADRS 1
ADRS 2
ADRS 3
ADRS 4
ADRS 5
S1
A1
A2
A3
A4
A5
LON
TON
Q6 74LS245
Q7 74LS244
Q3 8291A
C3 0.1
D0 D1 D2 D3 D4 D5 D6 D7
DIO 1 DIO 2 DIO 3 DIO 4 DIO 5 DIO 6 DIO 7 DIO 8
TR1
A0 A1 A2 RESET WR RD CS DACK
REN IFC NDAC NRFD DAV EOI ATN SRQ
CLOCK INT
Q4 SN75160AN
Q5 SN75161AN
TE PE
Q1 74LS00
Q1-14
Q1-7
C1 47
C2 0.1
J1
DIO1
DIO2
DIO3
DIO4
EOI
DAV
NRFD
NDAC
IFC
SRQ
ATN
DIO5
DIO6
DIO7
DIO8
REN
to GP-IB Cable
442U77923

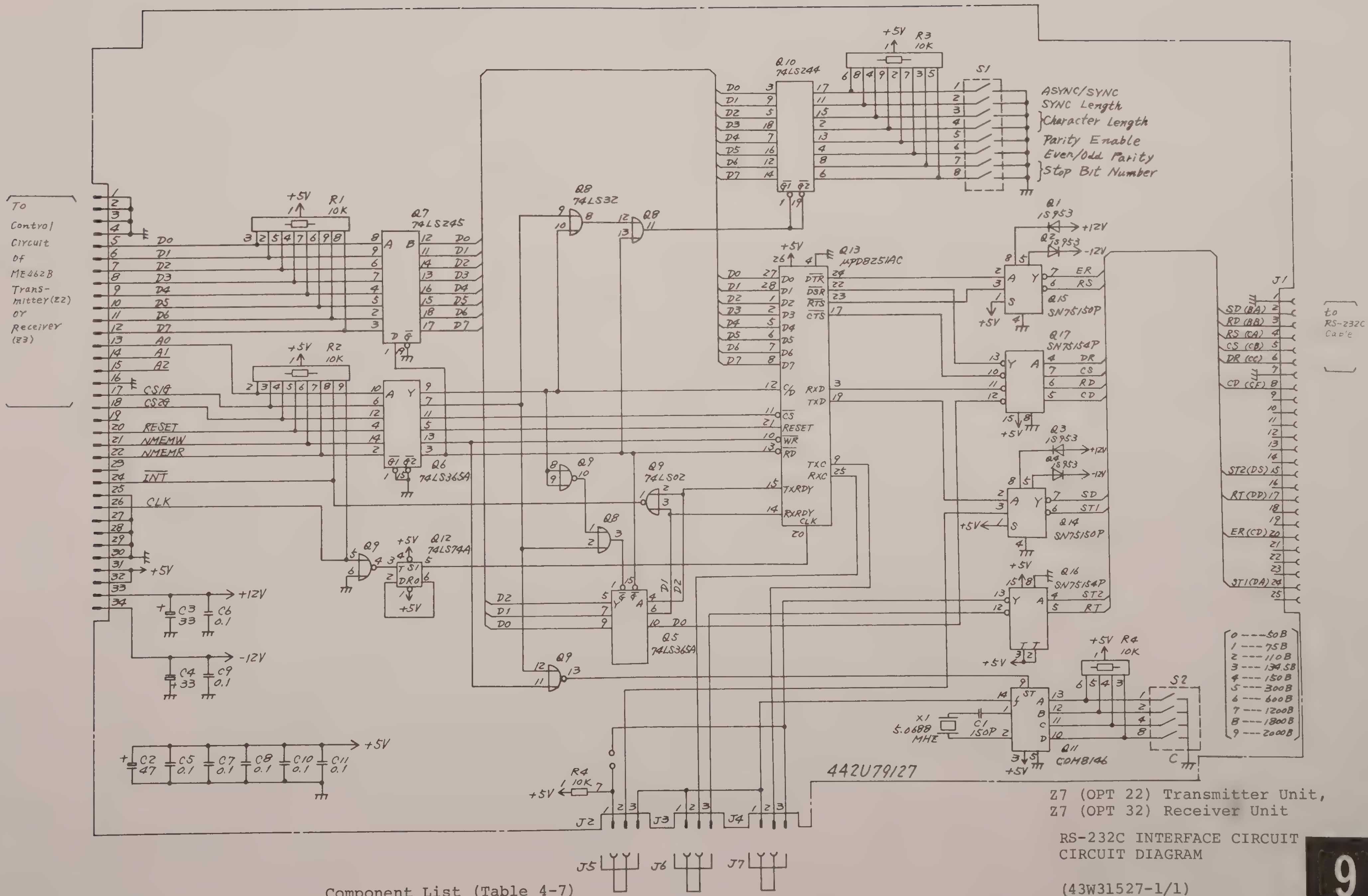
Z6 (OPT 21) Transmitter Unit,
Z6 (OPT 31) Receiver Unit

Component List (Table 4-6)

GP-IB INTERFACE CIRCUIT
CIRCUIT DIAGRAM

(43W30672-1/1)

8


To Control Circuit of ME462B Transmitter (Z2) or Receiver (Z3)
D0
D1
D2
D3
D4
D5
D6
D7
A0
A1
A2
CS1Ø
CS2Ø
RESET
NMEMW
NMEMR
INT
CLK
+5V
+12V
-12V
R1 10K
R2 10K
R3 10K
R4 10K
Q7 74LS245
Q6 74LS365A
Q8 74LS32
Q9 74LS02
Q10 74LS244
Q12 74LS74A
Q13 µPD8251AC
Q5 74LS365A
Q1 1S953
Q2 1S953
Q3 1S953
Q4 1S953
Q15 SN75150P
Q14 SN75150P
Q17 SN75154P
Q16 SN75154P
Q11 COM8146
X1 5.0688 MHZ
C1 150P
C2 47
C3 33
C4 33
C5 0.1
C6 0.1
C7 0.1
C8 0.1
C9 0.1
C10 0.1
C11 0.1
S1
ASYNC/SYNC
SYNC Length
Character Length
Parity Enable
Even/Odd Parity
Stop Bit Number
S2
DTR
DSR
RTS
CTS
RXD
TXD
TXC
RXC
TXRDY
RXRDY
CLK
C/D
CS
WR
RD
ER
RS
DR
CS
RD
CD
SD
ST1
ST2
RT
J1
SD (BA)
RD (BB)
RS (CA)
CS (CB)
DR (CC)
CD (CF)
ST2(DS)
RT (DD)
ER (CD)
ST1(DA)
to RS-232C Cable
0 --- 50B
1 --- 75B
2 --- 110B
3 --- 134.5B
4 --- 150B
5 --- 300B
6 --- 600B
7 --- 1200B
8 --- 1800B
9 --- 2000B
442U79127
J2
J3
J4
J5
J6
J7

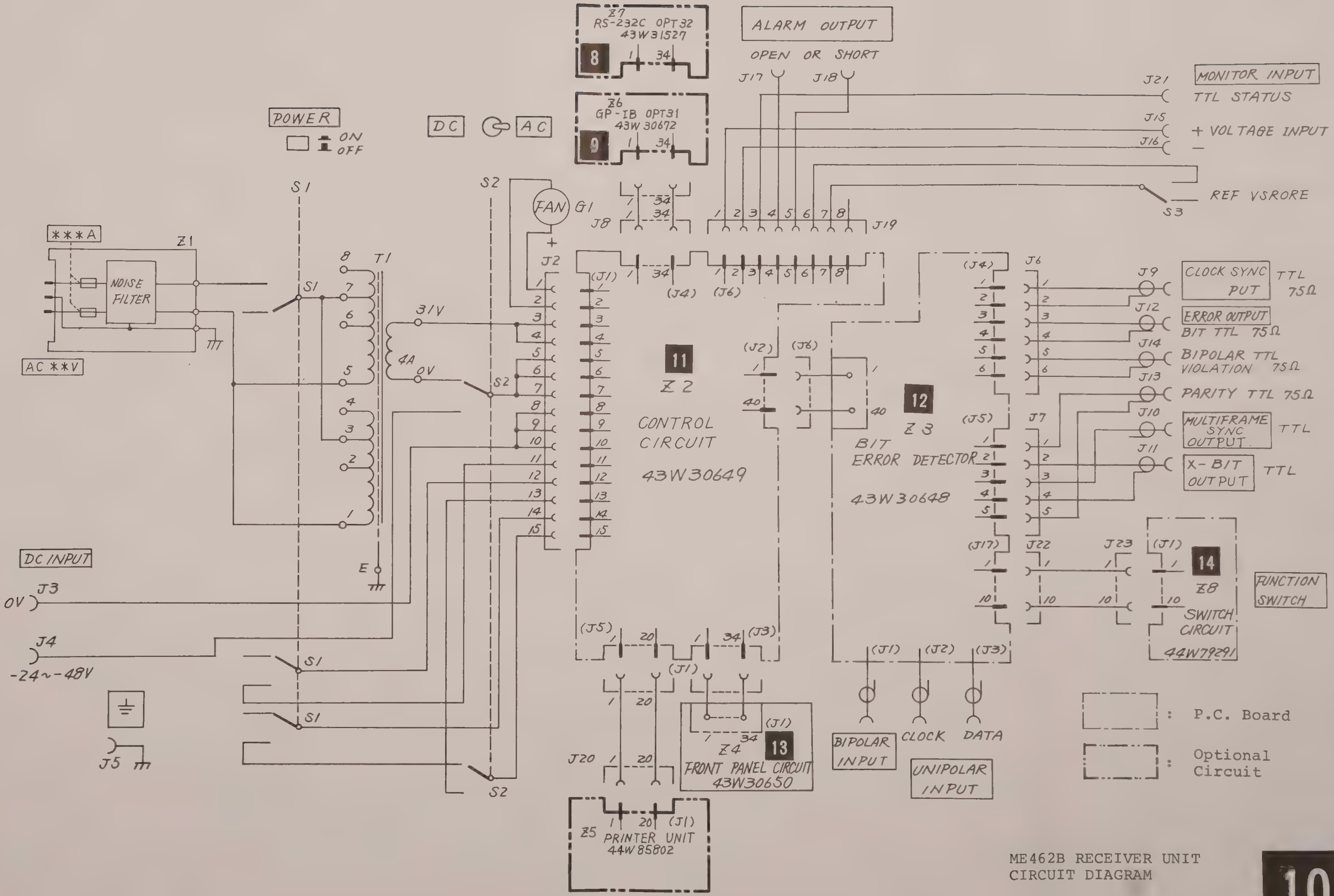
Z7 (OPT 22) Transmitter Unit,
Z7 (OPT 32) Receiver Unit

RS-232C INTERFACE CIRCUIT
CIRCUIT DIAGRAM

(43W31527-1/1)

Component List (Table 4-7)

9

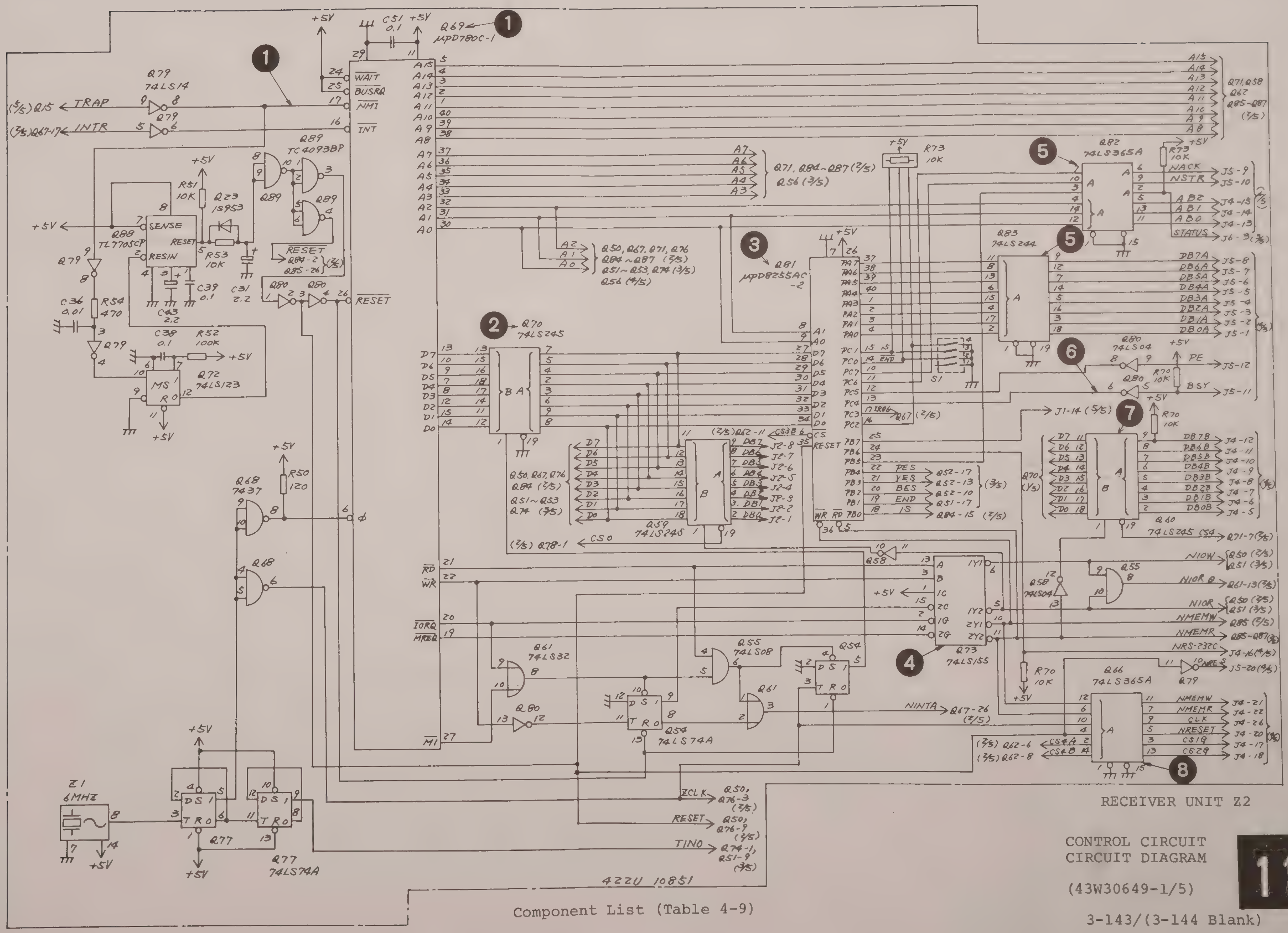

Z7 RS-232C OPT32 43W31527
8
GP-IB OPT31 43W 30672
Z6
9
ALARM OUTPUT
OPEN OR SHORT
J17
J18
MONITOR INPUT
J21 TTL STATUS
J15
J16
+ VOLTAGE INPUT
–
REF VSRORE
S3
POWER
ON
OFF
DC
AC
S1
S2
FAN G1
J8
J19
J2
***A
Z1
NOISE FILTER
AC **V
T1
31V
4A
0V
11
Z 2
CONTROL CIRCUIT
43W30649
12
Z 3
BIT ERROR DETECTOR
43W30648
J6
J7
J9 CLOCK SYNC PUT TTL 75Ω
J12 ERROR OUTPUT BIT TTL 75Ω
J14 BIPOLAR TTL VIOLATION 75Ω
J13 PARITY TTL 75Ω
J10 MULTIFRAME SYNC OUTPUT TTL
J11 X-BIT OUTPUT TTL
J22
J23
14
Z8
SWITCH CIRCUIT
44W79291
FUNCTION SWITCH
DC INPUT
J3 0V
J4 -24~-48V
E
J5
13
Z4
FRONT PANEL CIRCUIT 43W30650
J20
Z5 PRINTER UNIT 44W85802
BIPOLAR INPUT
CLOCK
DATA
UNIPOLAR INPUT
: P.C. Board
: Optional Circuit

ME462B RECEIVER UNIT
CIRCUIT DIAGRAM

(43W30647-1/1)

10

Component List (Table 4-8)


Q69 μPD780C-1
Q70 74LS245
Q81 μPD8255AC-2
Q73 74LS155
Q82 74LS365A
Q83 74LS244
Q80 74LS04
Q60 74LS245
Q66 74LS365A
Q59 74LS245
Q79 74LS14
Q89 TC4093BP
Q88 TL7705CP
Q23 1S953
Q72 74LS123
Q68 7437
Q61 74LS32
Q55 74LS08
Q54 74LS74A
Q77 74LS74A
Q58 74LS04
Z1 6MHZ
TRAP
INTR
WAIT
BUSRQ
NMI
INT
RESET
M1
RD
WR
IORQ
MREQ
A15 A14 A13 A12 A11 A10 A9 A8
A7 A6 A5 A4 A3 A2 A1 A0
D7 D6 D5 D4 D3 D2 D1 D0
NACK
NSTR
STATUS
DB7A DB6A DB5A DB4A DB3A DB2A DB1A DB0A
DB7B DB6B DB5B DB4B DB3B DB2B DB1B DB0B
PE
BSY
PES
YES
BES
END
IS
NIOW
NIOR
NMEMW
NMEMR
NRS-232C
NRES
NINTA
CLK
NRESET
CS1Q
CS2Q
CS4A
CS4B
CS0
ZCLK
TINO
S1
R73 10K
R51 10K
R53 10K
R54 470
R52 100K
R50 120
R70 10K
C51 0.1
C36 0.01
C38 0.1
C39 0.1
C43 2.2
C31 2.2
①
②
③
④
⑤
⑥
⑦
⑧
422U 10851

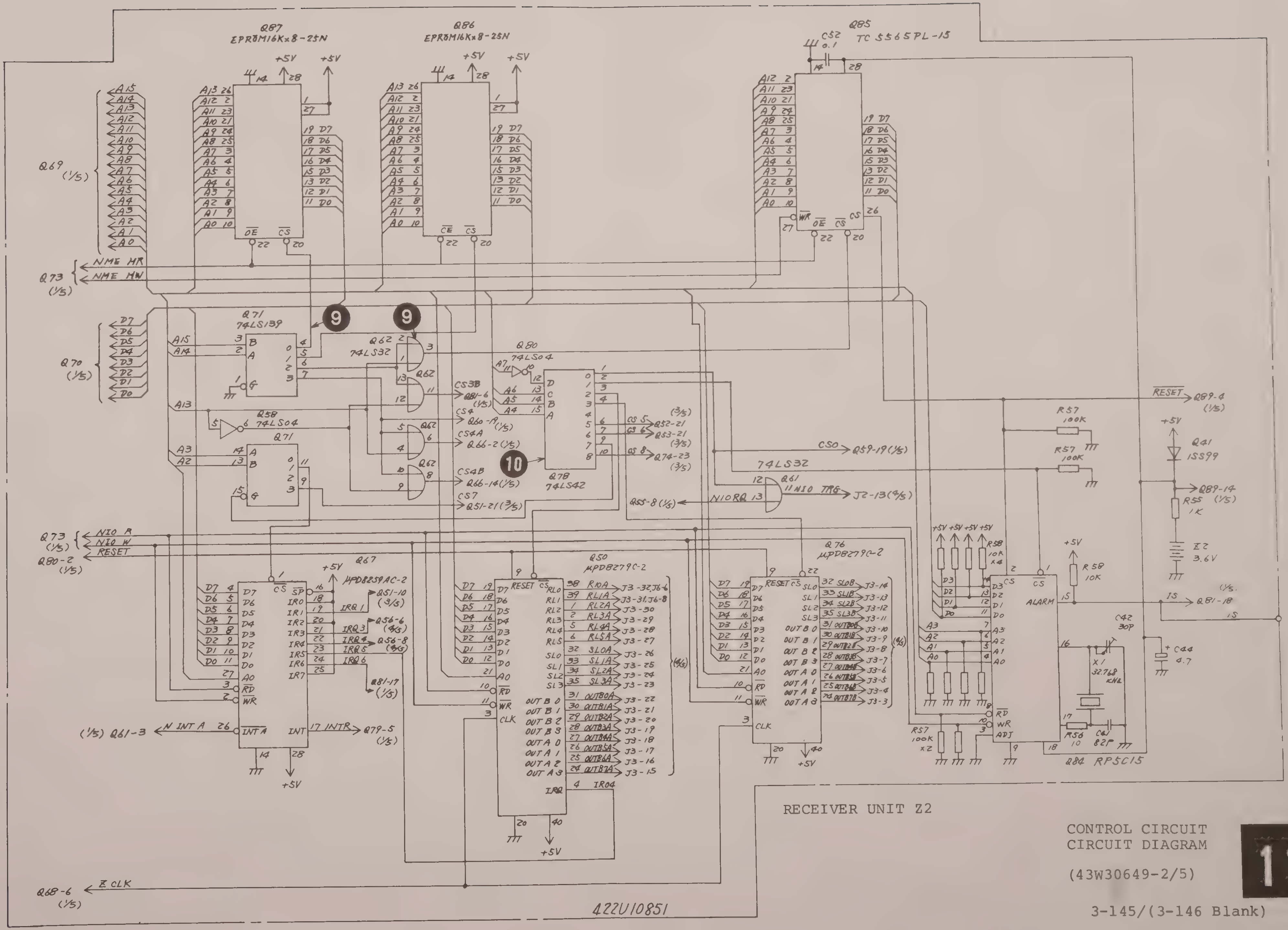
Component List (Table 4-9)

RECEIVER UNIT Z2

CONTROL CIRCUIT
CIRCUIT DIAGRAM

(43W30649-1/5)

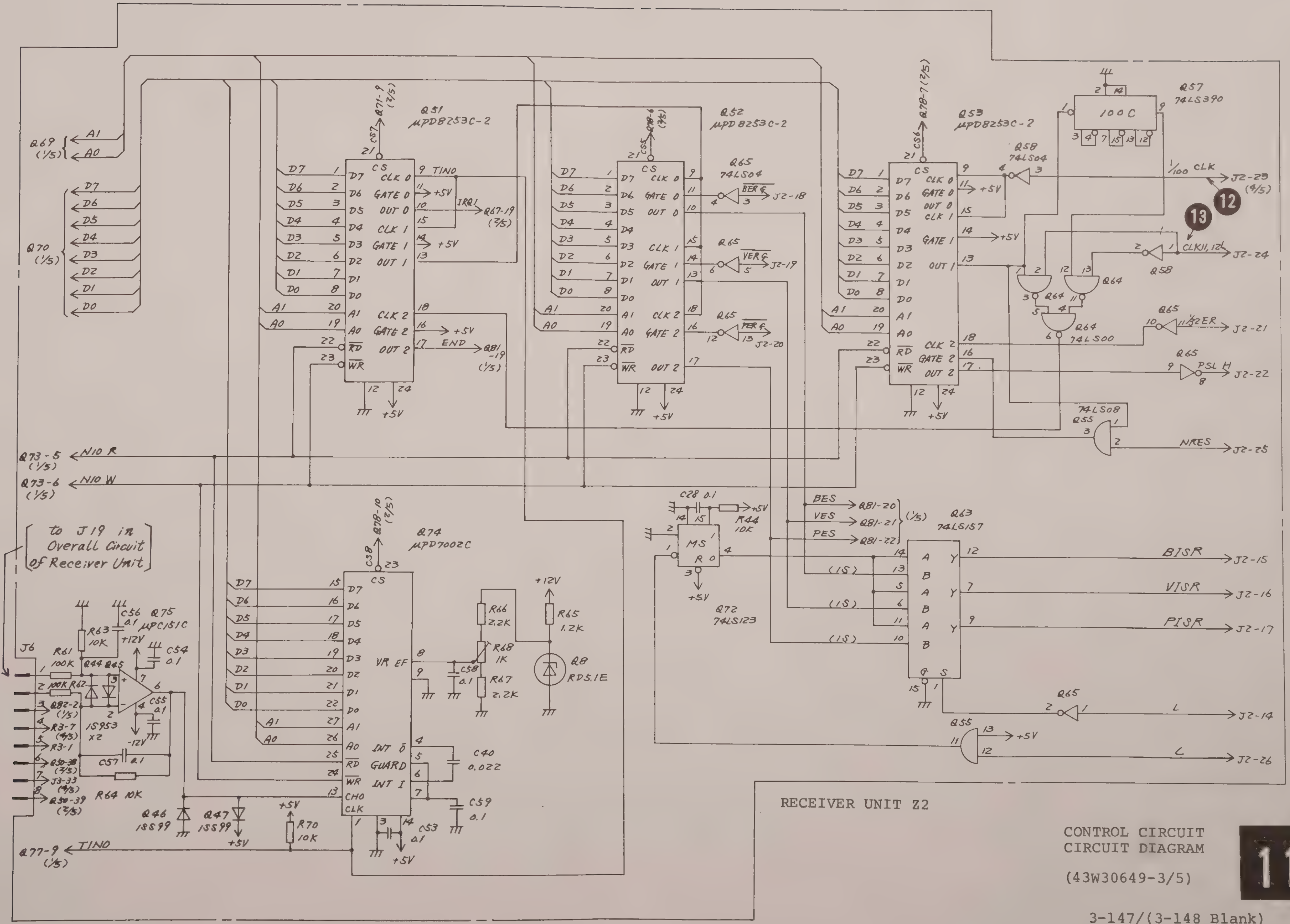
11


Q87
EPROM16K×8-25N
Q86
EPROM16K×8-25N
Q85
TC 5565PL-15
C52 0.1
+5V
Q69 (1/5)
A15
A14
A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
D7
D6
D5
D4
D3
D2
D1
D0
OE
CE
CS
WR
Q73 (1/5)
NME MR
NME MW
Q70 (1/5)
Q71
74LS139
Q62
74LS32
Q80
74LS04
Q58
74LS04
Q78
74LS42
9
10
CS3B
Q81-6 (1/5)
CS4
Q60-11 (1/5)
CS4A
Q66-2 (1/5)
CS4B
Q66-14 (1/5)
CS7
Q51-21 (3/5)
CS5
CS6
CS8
Q52-21
Q53-21
Q74-23
(3/5)
CS0
Q59-19 (1/5)
74LS32
Q61
NIO TRG
J2-13 (4/5)
NIORQ
Q55-8 (1/5)
RESET
Q89-4 (1/5)
R57 100K
Q41 1SS99
Q89-14 (1/5)
R55 1K
E2 3.6V
Q73 (1/5)
NIO R
NIO W
RESET
Q80-2 (1/5)
Q67
μPD8259AC-2
SP
IR0
IR1
IR2
IR3
IR4
IR5
IR6
IR7
IRQ1
IRQ3
IRQ4
IRQ5
IRQ6
Q51-10 (3/5)
Q56-6 (4/5)
Q56-8 (4/5)
Q81-17 (1/5)
RD
INTA
INT
INTR
Q79-5 (1/5)
(1/5) Q61-3
N INT A
Q50
μPD8279C-2
RL0
RL1
RL2
RL3
RL4
RL5
SL0
SL1
SL2
SL3
OUT B 0
OUT B 1
OUT B 2
OUT B 3
OUT A 0
OUT A 1
OUT A 2
OUT A 3
CLK
IRQ
IRQ4
J3-32,J6-6
J3-31,J6-8
J3-30
J3-29
J3-28
J3-27
J3-26
J3-25
J3-24
J3-23
J3-22
J3-21
J3-20
J3-19
J3-18
J3-17
J3-16
J3-15
(4/5)
Q76
μPD8279C-2
SL0B
SL1B
SL2B
SL3B
J3-14
J3-13
J3-12
J3-11
J3-10
J3-9
J3-8
J3-7
J3-6
J3-5
J3-4
J3-3
R58 10K ×4
R58 10K
ALARM
Q81-18
C42 30P
C44 4.7
X1 32.768 KHz
R56 10
C61 82P
ADJ
R57 100K ×2
Q84 RP5C15
Q68-6 (1/5)
Z CLK
422U10851

RECEIVER UNIT Z2

CONTROL CIRCUIT
CIRCUIT DIAGRAM

(43W30649-2/5)

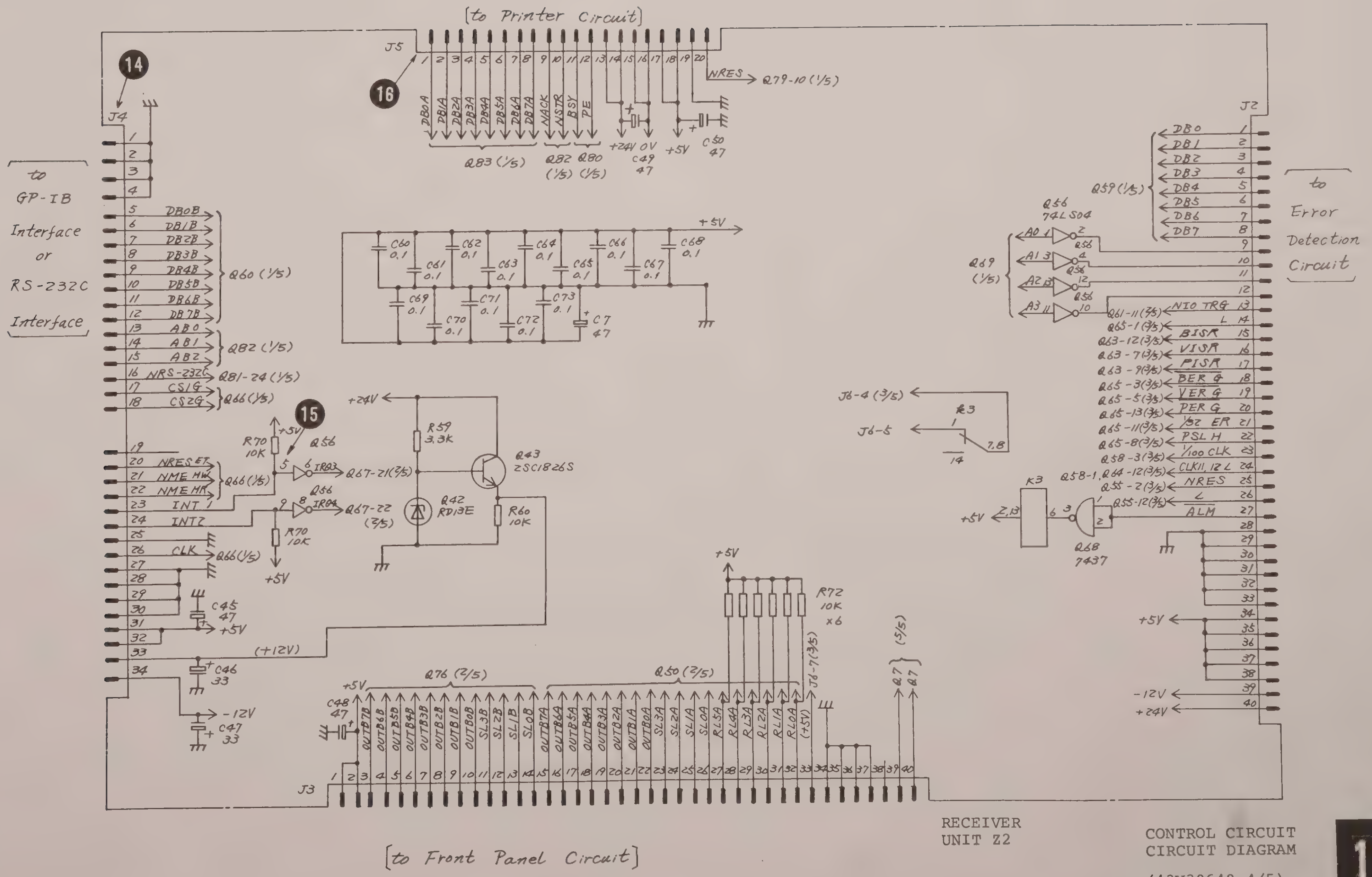

Q51
μPD8253C-2
Q52
μPD8253C-2
Q53
μPD8253C-2
Q57
74LS390
100C
1/100 CLK
J2-23 (4/5)
⑫
⑬
CLKII, 12I
J2-24
Q58
74LS04
Q65
74LS04
BER G
J2-18
VER G
J2-19
PER G
J2-20
Q64
74LS00
1/32ER
J2-21
PSL H
J2-22
Q55
74LS08
NRES
J2-25
Q69 (1/5)
A1
A0
Q70 (1/5)
D7
D6
D5
D4
D3
D2
D1
D0
CS
CLK 0
GATE 0
OUT 0
CLK 1
GATE 1
OUT 1
CLK 2
GATE 2
OUT 2
RD
WR
TINO
IRQ1
Q67-19 (2/5)
END
Q81-19 (1/5)
Q71-9 (2/5)
Q78-6 (4/5)
Q78-7 (2/5)
+5V
Q73-5 (1/5)
NIO R
Q73-6 (1/5)
NIO W
C28 0.1
R44 10K
MS
Q72
74LS123
BES
VES
PES
Q81-20
Q81-21
Q81-22
(1/5)
(1S)
Q63
74LS157
BISR
J2-15
VISR
J2-16
PISR
J2-17
L
J2-14
J2-26
Q74
μPD7002C
Q78-10 (2/5)
VR EF
INT 0
GUARD
INT 1
CH0
CLK
C40 0.022
C59 0.1
C53 0.1
C58 0.1
R66 2.2K
R68 1K
R67 2.2K
R65 1.2K
+12V
Q8
RD5.1E
to J19 in Overall Circuit of Receiver Unit
J6
R61 100K
R62 100K
R63 10K
C56 0.1
Q75
μPC151C
C54 0.1
C55 0.1
Q44
Q45
1S953 x2
-12V
C57 0.1
R64 10K
Q82-2 (1/5)
R3-7 (4/5)
R3-1
Q50-38 (2/5)
J3-33 (4/5)
Q50-39 (2/5)
Q46 1SS99
Q47 1SS99
R70 10K
Q77-9 (1/5)
TINO

RECEIVER UNIT Z2

CONTROL CIRCUIT
CIRCUIT DIAGRAM

(43W30649-3/5)

11

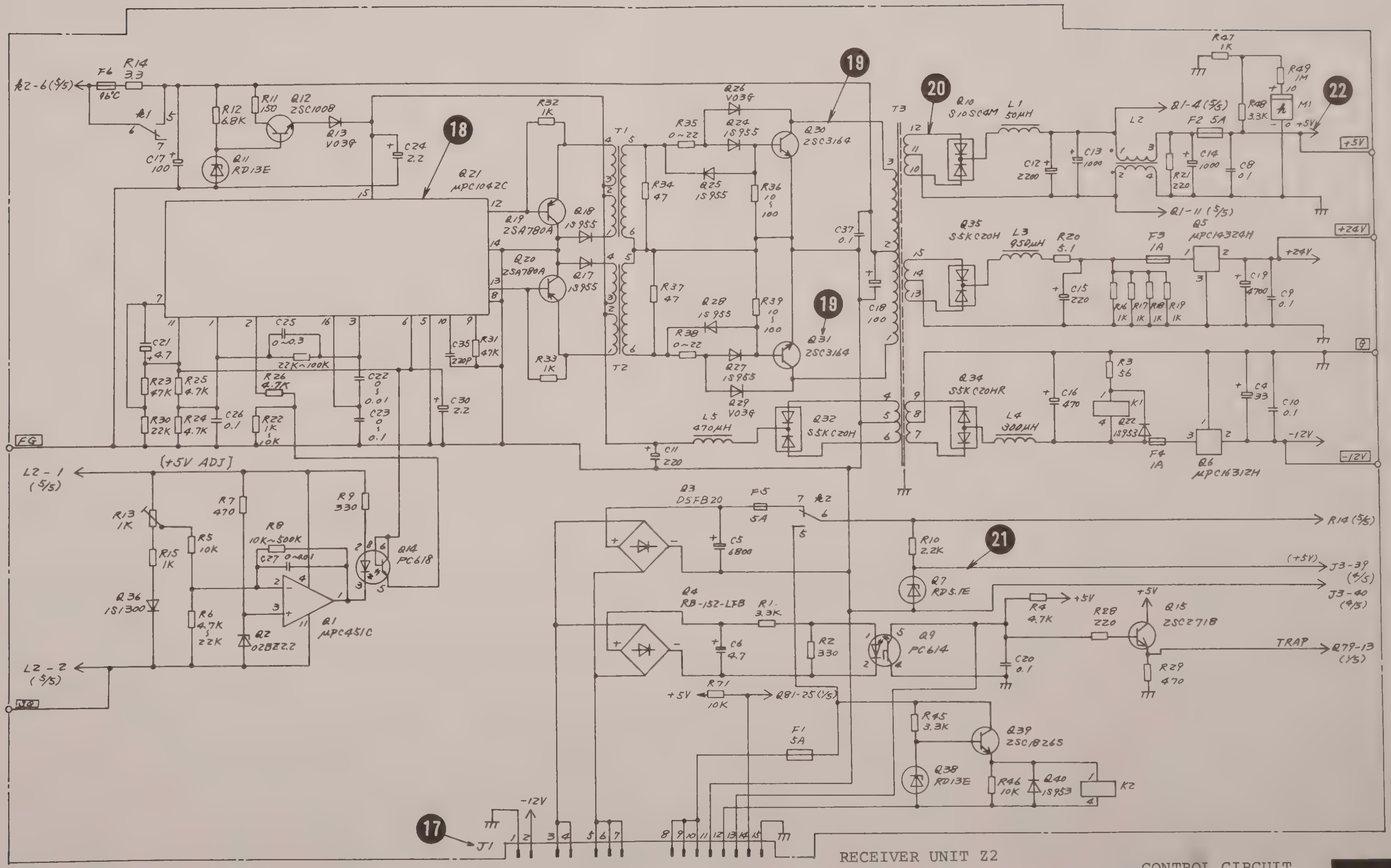

[to Printer Circuit]
J5
14
15
16
J4
to GP-IB Interface or RS-232C Interface
DB0B
DB1B
DB2B
DB3B
DB4B
DB5B
DB6B
DB7B
Q60 (1/5)
AB0
AB1
AB2
Q82 (1/5)
NRS-232C
Q81-24 (1/5)
CS1G
CS2G
Q66 (1/5)
NRESET
NME MW
NME MR
INT 1
INT2
CLK
Q66 (1/5)
R70 10K
+5V
Q56
IR03
IR04
Q67-21 (2/5)
Q67-22 (2/5)
C45 47
C46 33
C47 33
C48 47
(+12V)
-12V
+24V
R59 3.3K
Q43 2SC1826S
Q42 RD13E
R60 10K
DB0A
DB1A
DB2A
DB3A
DB4A
DB5A
DB6A
DB7A
NACK
NSTR
BSY
PE
Q83 (1/5)
Q82 (1/5)
Q80 (1/5)
+24V
0V
C49 47
C50 47
NRES
Q79-10 (1/5)
C60 0.1
C61 0.1
C62 0.1
C63 0.1
C64 0.1
C65 0.1
C66 0.1
C67 0.1
C68 0.1
C69 0.1
C70 0.1
C71 0.1
C72 0.1
C73 0.1
C7 47
J2
to Error Detection Circuit
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
Q59 (1/5)
Q56 74LS04
A0
A1
A2
A3
Q69 (1/5)
Q61-11 (2/5)
NIO TRG
Q65-1 (3/5)
L
Q63-12 (3/5)
BISR
Q63-7 (3/5)
VISR
Q63-9 (3/5)
PISR
Q65-3 (3/5)
BER G
Q65-5 (3/5)
VER G
Q65-13 (3/5)
PER G
Q65-11 (3/5)
1/32 ER
Q65-8 (3/5)
PSL H
Q58-3 (3/5)
1/100 CLK
Q58-1, Q64-12 (3/5)
CLK11, 12 L
Q55-2 (3/5)
NRES
Q55-12 (3/5)
L
ALM
J6-4 (3/5)
J6-5
K3
K3
Q68 7437
R72 10K ×6
Q76 (2/5)
Q50 (2/5)
OUTB7B
OUTB6B
OUTB5B
OUTB4B
OUTB3B
OUTB2B
OUTB1B
OUTB0B
SL3B
SL2B
SL1B
SL0B
OUTB7A
OUTB6A
OUTB5A
OUTB4A
OUTB3A
OUTB2A
OUTB1A
OUTB0A
SL3A
SL2A
SL1A
SL0A
RL5A
RL4A
RL3A
RL2A
RL1A
RL0A
(+5V)
J6-7 (3/5)
Q7 (5/5)
J3
[to Front Panel Circuit]

RECEIVER
UNIT Z2

CONTROL CIRCUIT
CIRCUIT DIAGRAM

(43W30649-4/5)

11

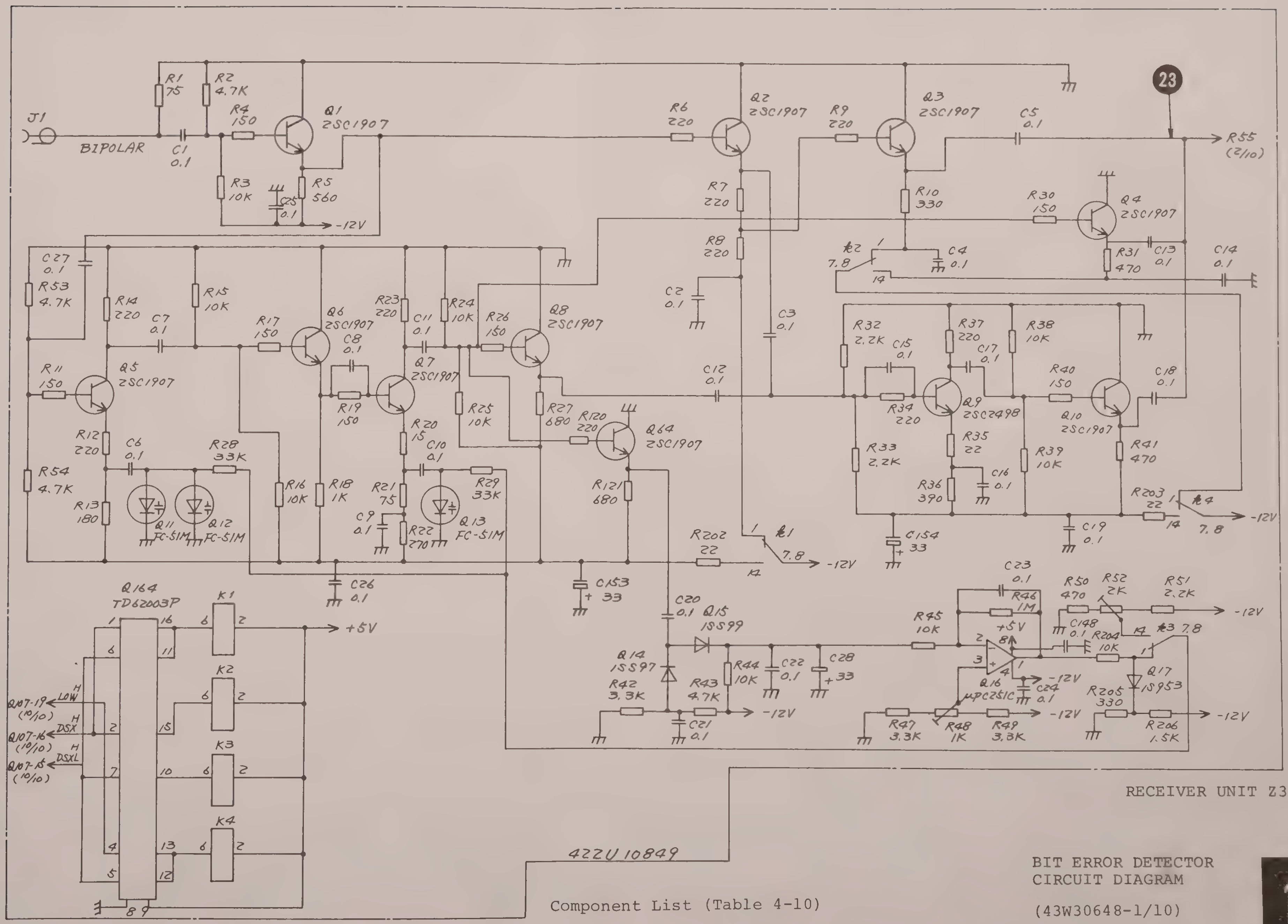

18
19
20
21
22
17
RECEIVER UNIT Z2
F6
R14 3.3
96°C
K2-6 (5/5)
K1
C17 100
R12 6.8K
R11 150
Q12 2SC1008
Q13 V03G
Q11 RD13E
C24 2.2
Q21 μPC1042C
R32 1K
Q19 2SA780A
Q18 1S955
Q20 2SA780A
Q17 1S955
R33 1K
T1
T2
C21 4.7
R23 47K
R25 4.7K
R30 22K
R24 4.7K
C26 0.1
C25 0~0.3
22K~100K
R26 4.7K
R22 1K ~ 10K
C22 0 ~ 0.01
C23 0 ~ 0.1
C35 220P
R31 47K
C30 2.2
FG
R35 0~22
Q26 V03G
Q24 1S955
Q25 1S955
R34 47
R36 10 ~ 100
Q30 2SC3164
R37 47
Q28 1S955
R39 10 ~ 100
R38 0~22
Q27 1S955
Q29 V03G
Q31 2SC3164
C37 0.1
C18 100
L5 470μH
C11 220
Q32 S5KC20H
T3
Q10 S10SC4M
L1 50μH
C12 2200
C13 1000
L2
Q1-4 (5/5)
Q1-11 (5/5)
F2 5A
R21 220
C14 1000
C8 0.1
R47 1K
R48 3.3K
R49 1M
10
M1
+5V
Q35 S5KC20H
L3 950μH
R20 5.1
C15 220
F3 1A
R16 1K
R17 1K
R18 1K
R19 1K
Q5 μPC14324H
C19 4700
C9 0.1
+24V
Q34 S5KC20HR
L4 300μH
C16 470
R3 56
K1
Q22 1S953
F4 1A
Q6 μPC16312H
C4 33
C10 0.1
-12V
L2-1 (5/5)
[+5V ADJ]
R13 1K
R15 1K
Q36 1S1300
R5 10K
R6 4.7K ~ 22K
R7 470
R8 10K~500K
C27 0~0.01
Q2 02BZ2.2
Q1 μPC451C
R9 330
Q14 PC618
L2-2 (5/5)
JG
Q3 D5FB20
F5 5A
K2
C5 6800
R10 2.2K
Q7 RD5.1E
R14 (5/5)
(+5V) J3-39 (4/5)
J3-40 (4/5)
Q4 RB-152-LFB
R1 3.3K
C6 4.7
R2 330
Q9 PC614
R4 4.7K
+5V
R28 220
Q15 2SC2718
C20 0.1
R29 470
TRAP
Q79-13 (1/5)
R71 10K
Q81-25 (1/5)
F1 5A
R45 3.3K
Q39 2SC1826S
Q38 RD13E
R46 10K
Q40 1S953
K2
J1
-12V
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

(to J2 in Circuit Diagram
10 of ME462B Receiver)

CONTROL CIRCUIT
CIRCUIT DIAGRAM

(43W30649-5/5)

11


J1
BIPOLAR
R1 75
R2 4.7K
C1 0.1
R4 150
Q1 2SC1907
R3 10K
C25 0.1
R5 560
-12V
R6 220
Q2 2SC1907
R9 220
Q3 2SC1907
C5 0.1
23
R55 (2/10)
R7 220
R8 220
R10 330
R30 150
Q4 2SC1907
K2 1 7.8 14
C4 0.1
R31 470
C13 0.1
C14 0.1
C2 0.1
C3 0.1
C27 0.1
R53 4.7K
R14 220
R15 10K
C7 0.1
R17 150
Q6 2SC1907
C8 0.1
R23 220
C11 0.1
R24 10K
R26 150
Q8 2SC1907
R11 150
Q5 2SC1907
R19 150
Q7 2SC1907
R25 10K
R27 680
R120 220
Q64 2SC1907
C12 0.1
R32 2.2K
C15 0.1
R37 220
C17 0.1
R38 10K
R40 150
C18 0.1
R34 220
Q9 2SC2498
Q10 2SC1907
R35 22
R33 2.2K
R39 10K
R41 470
R36 390
C16 0.1
R203 22
K4 1 14 7.8
-12V
R12 220
C6 0.1
R28 33K
R20 15
C10 0.1
R29 33K
R54 4.7K
R16 10K
R18 1K
R21 75
R121 680
R13 180
Q11 FC-51M
Q12 FC-51M
C9 0.1
R22 270
Q13 FC-51M
R202 22
K1 1 7.8 K1
-12V
C154 33
C19 0.1
C26 0.1
C153 33
Q164 TD62003P
K1 6 2
+5V
1 16 6 11
Q107-19 (10/10) H LOW
Q107-16 (10/10) H DSX
Q107-15 (10/10) H DSXL
K2 6 2
2 15
K3 6 2
7 10
K4 6 2
4 13
5 12
8 9
C20 0.1
Q15 1SS99
Q14 1SS97
R42 3.3K
C21 0.1
R43 4.7K
R44 10K
C22 0.1
C28 33
-12V
C23 0.1
R46 1M
R50 470
R52 2K
R51 2.2K
-12V
R45 10K
+5V
C148 0.1
R204 10K
K3 1 7.8 K1
Q16 μPC251C
C24 0.1
-12V
Q17 1S953
R47 3.3K
R48 1K
R49 3.3K
-12V
R205 330
R206 1.5K
-12V
422U 10849

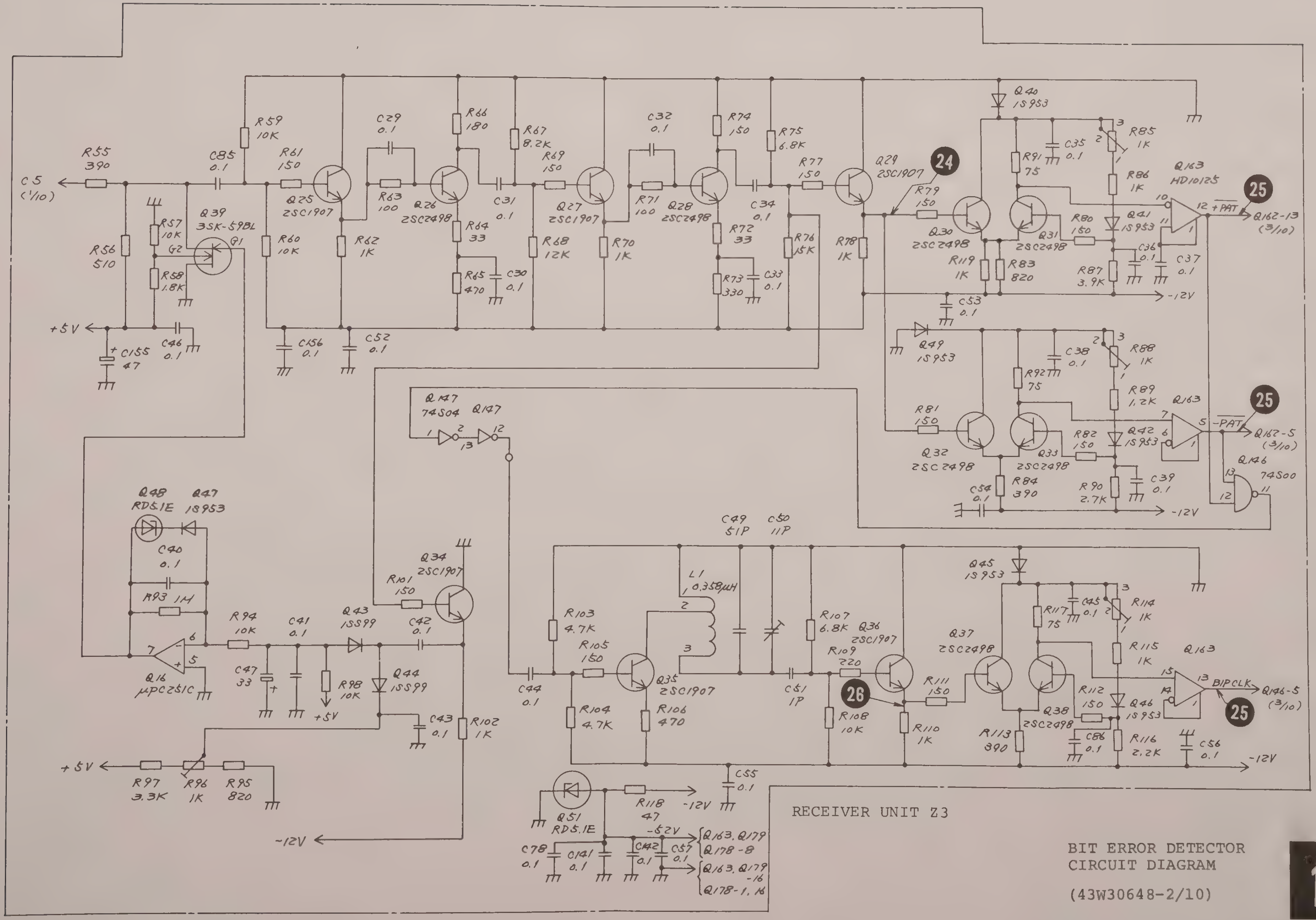
Component List (Table 4-10)

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-1/10)

12

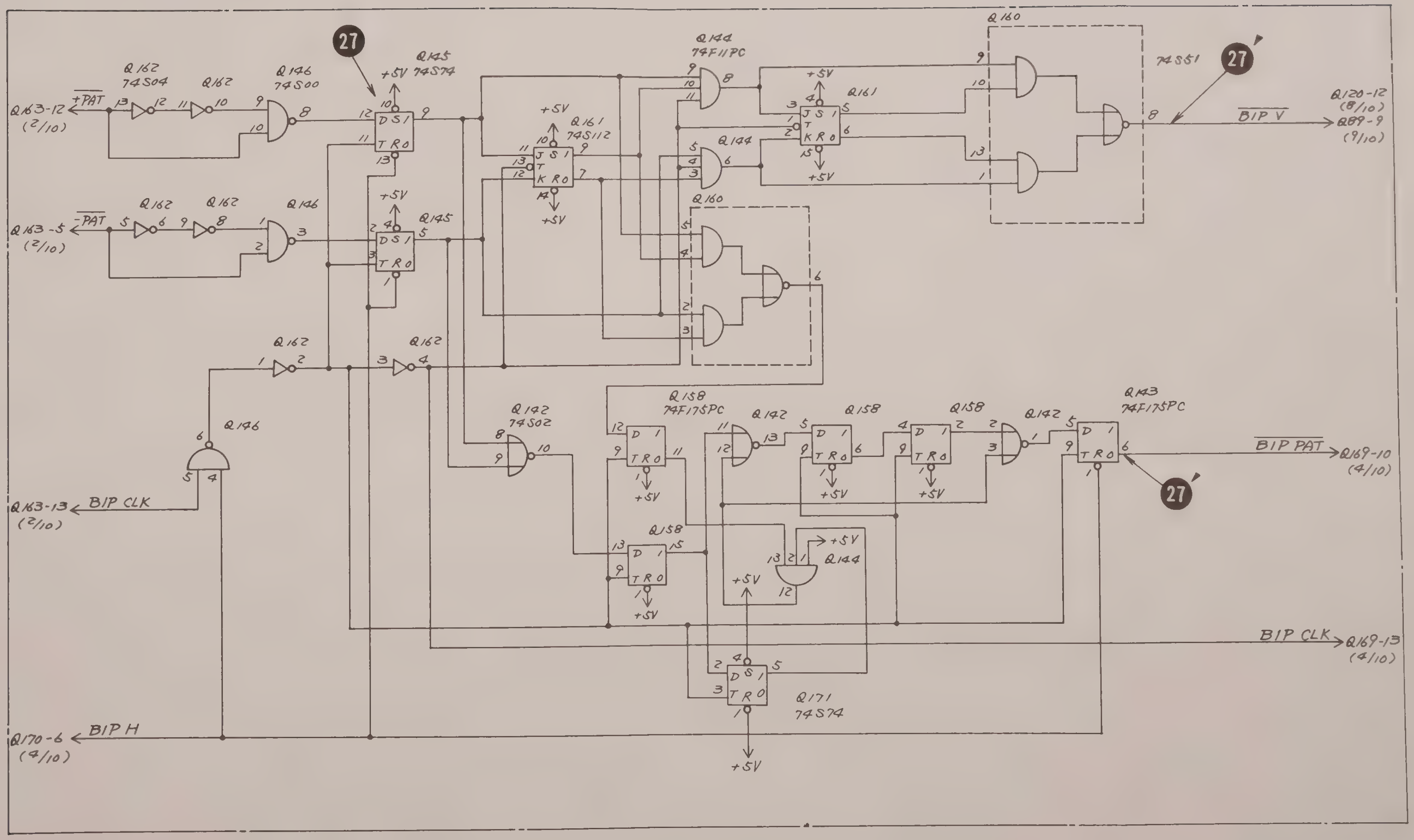

C5
(1/10)
R55 390
R56 510
R57 10K
G2
Q39 3SK-59BL
G1
R58 1.8K
+5V
C155 47
C46 0.1
C85 0.1
R59 10K
R61 150
Q25 2SC1907
R60 10K
R62 1K
C156 0.1
C52 0.1
C29 0.1
R63 100
Q26 2SC2498
R66 180
R64 33
R65 470
C30 0.1
R67 8.2K
R69 150
C31 0.1
Q27 2SC1907
R68 12K
R70 1K
C32 0.1
R71 100
Q28 2SC2498
R74 150
R72 33
R73 330
C33 0.1
R75 6.8K
C34 0.1
R76 15K
R77 150
Q29 2SC1907
R78 1K
24
R79 150
Q30 2SC2498
Q31 2SC2498
R119 1K
R83 820
Q40 1S953
R91 75
C35 0.1
R85 1K
R86 1K
Q41 1S953
R80 150
C36 0.1
R87 3.9K
C37 0.1
-12V
Q163 HD10125
10
12
11
+PAT
25
Q162-13 (3/10)
C53 0.1
Q49 1S953
C38 0.1
R88 1K
R92 75
R89 1.2K
Q163
7
6
5
-PAT
25
Q162-5 (3/10)
R81 150
Q32 2SC2498
Q33 2SC2498
R82 150
Q42 1S953
R84 390
C54 0.1
R90 2.7K
C39 0.1
-12V
Q146 74S00
13
12
11
Q147 74S04
Q147
1
2
13
12
Q48 RD5.1E
Q47 1S953
C40 0.1
R93 1M
R94 10K
7
6
5
Q16 μPC251C
C47 33
C41 0.1
R98 10K
+5V
Q43 1SS99
Q44 1SS99
C42 0.1
C43 0.1
Q34 2SC1907
R101 150
R102 1K
+5V
R97 3.3K
R96 1K
R95 820
-12V
C49 51P
C50 11P
L1 0.358μH
1
2
3
R103 4.7K
R105 150
Q35 2SC1907
C44 0.1
R104 4.7K
R106 470
C51 1P
R107 6.8K
Q36 2SC1907
R109 220
26
R108 10K
R110 1K
R111 150
Q37 2SC2498
Q38 2SC2498
R113 390
Q45 1S953
R117 75
C45 0.1
R114 1K
R115 1K
R112 150
Q46 1S953
C86 0.1
R116 2.2K
C56 0.1
-12V
Q163
15
14
13
BIPCLK
Q146-5 (3/10)
25
Q51 RD5.1E
R118 47
-12V
C55 0.1
-5.2V
Q163, Q179
Q178-8
C78 0.1
C141 0.1
C142 0.1
C57 0.1
Q163, Q179 -16
Q178-1, 16

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-2/10)

12

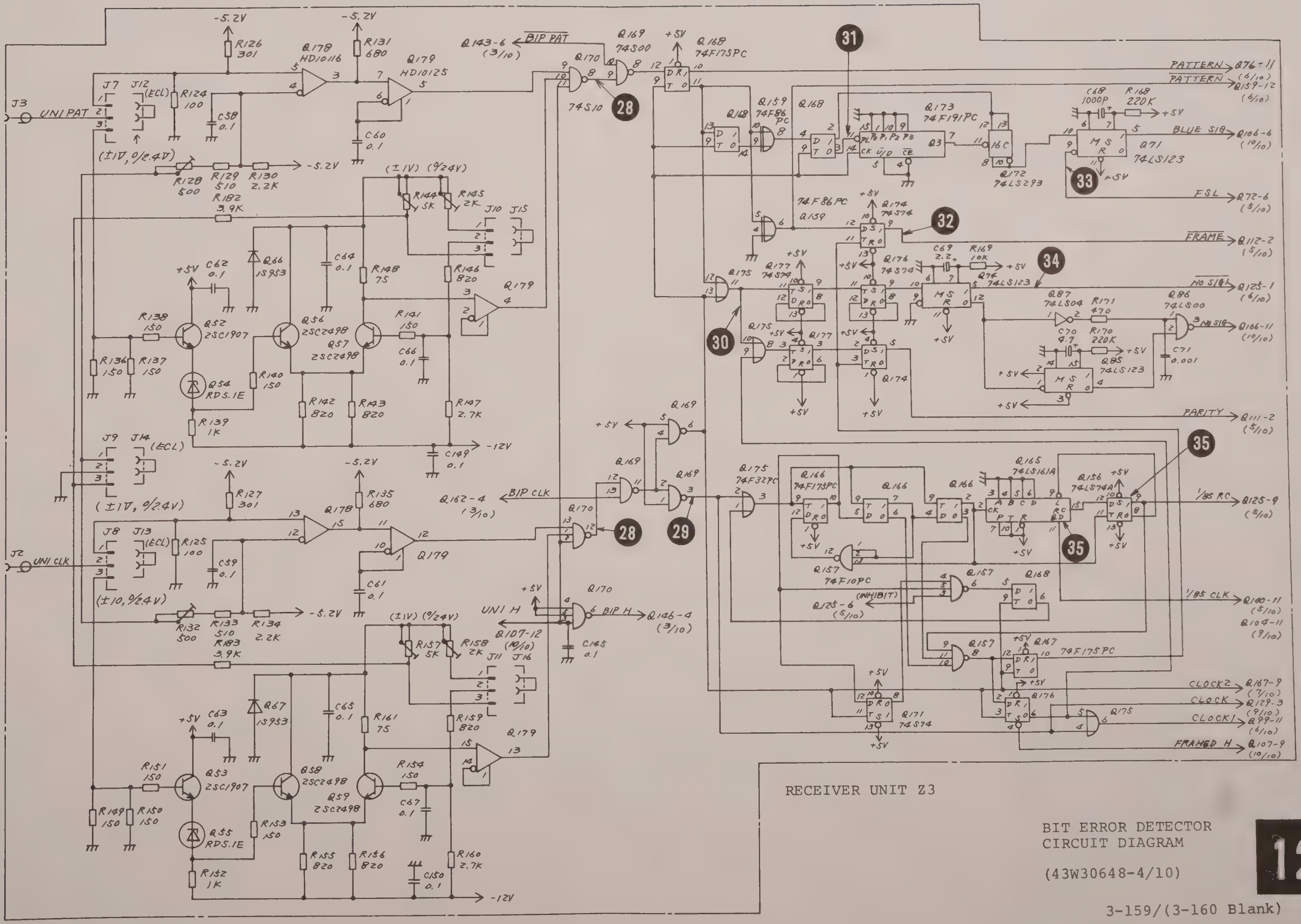

27
Q162
74S04
Q162
Q146
74S00
Q145
74S74
+5V
Q144
74F11PC
Q160
74S51
Q161
74S112
Q163-12
(2/10)
+PAT
-PAT
Q163-5
(2/10)
BIP V
Q120-12
(8/10)
Q89-9
(9/10)
Q142
74S02
Q158
74F175PC
Q143
74F175PC
BIP PAT
Q169-10
(4/10)
Q163-13
(2/10)
BIP CLK
BIP CLK
Q169-13
(4/10)
Q171
74S74
BIP H
Q170-6
(4/10)

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-3/10)

12

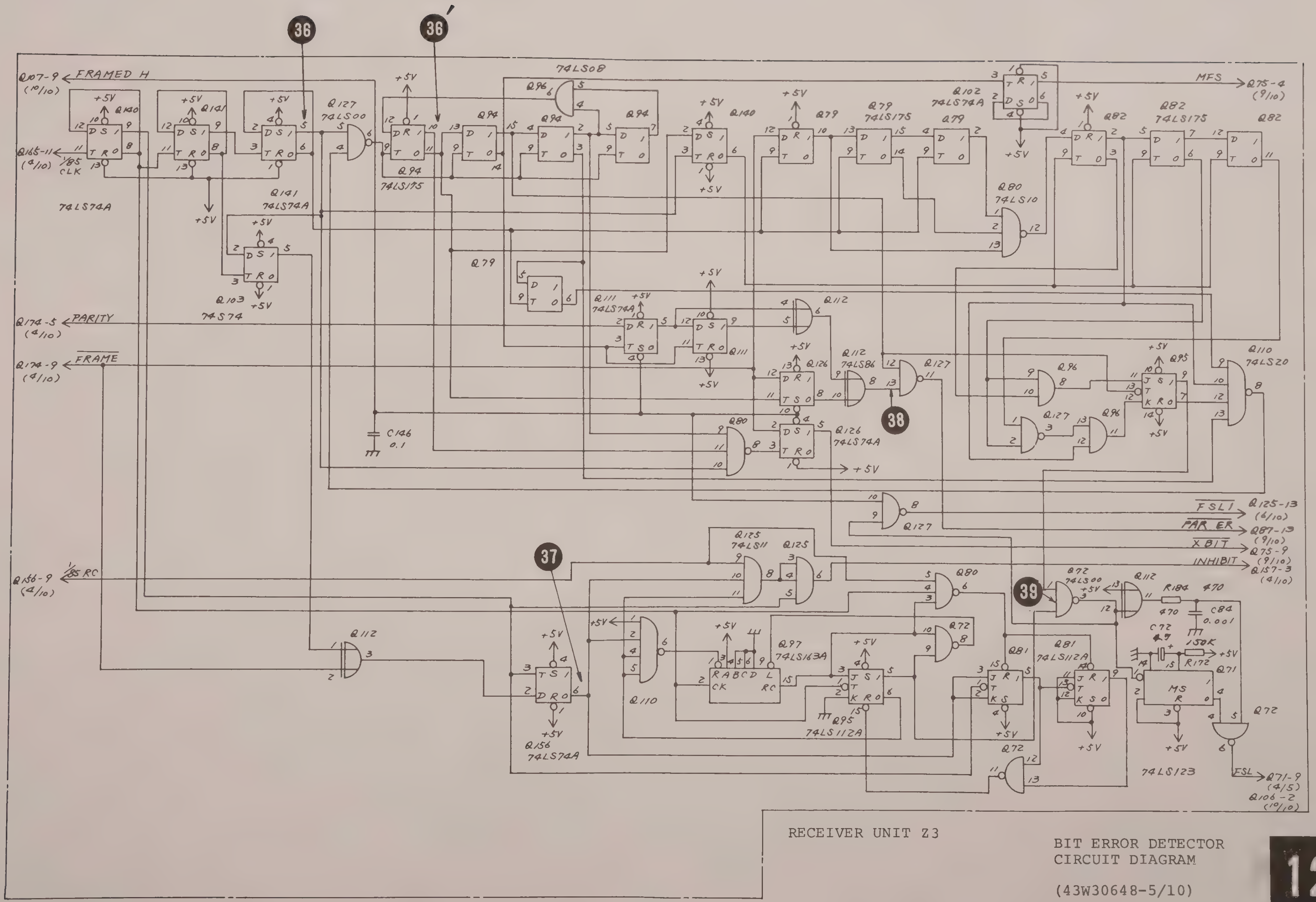

J3
UNI PAT
J7
J12
(ECL)
R124 100
C58 0.1
(±1V, 0/2.4V)
R128 500
R129 510
R130 2.2K
-5.2V
R126 301
Q178 HD10116
R131 680
Q179 HD10125
C60 0.1
BIP PAT
Q143-6 (3/10)
Q170
74S10
Q169 74S00
Q168 74F175PC
+5V
28
31
PATTERN
Q76-11 (6/10)
Q159-12 (6/10)
Q159 74F86PC
Q168
Q173 74F191PC
Q172 74LS293
C68 1000P
R168 220K
BLUE SIG
Q106-6 (10/10)
Q71 74LS123
33
FSL
Q72-6 (5/10)
R182 3.9K
(±1V) (0/24V)
R144 5K
R145 2K
J10
J15
74F86PC
Q159
Q174 74S74
32
FRAME
Q112-2 (5/10)
C62 0.1
Q66 1S953
C64 0.1
R148 75
R146 820
Q179
Q177 74S74
Q175
Q176 74S74
C69 2.2
R169 10K
Q74 74LS123
34
NO SIG
Q125-1 (6/10)
R138 150
Q52 2SC1907
Q56 2SC2498
Q57 2SC2498
R141 150
C66 0.1
30
Q87 74LS04
R171 470
Q86 74LS00
NO SIG
Q106-11 (10/10)
C70 4.7
R170 220K
Q85 74LS123
C71 0.001
R136 150
R137 150
Q54 RDS.1E
R140 150
R142 820
R143 820
R147 2.7K
R139 1K
C149 0.1
-12V
PARITY
Q111-2 (5/10)
J9
J14
(ECL)
Q169
35
(±1V, 0/2.4V)
R127 301
R135 680
Q162-4 (3/10)
BIP CLK
Q178
Q170
29
Q175 74F32PC
Q166 74F175PC
Q166
Q165 74LS161A
Q156 74LS74A
1/85 RC
Q125-9 (5/10)
J8
J13
R125 100
C59 0.1
J2
UNI CLK
C61 0.1
(±10, 0/2.4V)
R132 500
R133 510
R134 2.2K
R183 3.9K
Q157 74F10PC
(INHIBIT)
Q125-6 (5/10)
Q157
Q168
1/85 CLK
Q140-11 (5/10)
Q104-11 (9/10)
UNI H
Q107-12 (10/10)
BIP H
Q146-4 (3/10)
C145 0.1
R157 5K
R158 2K
J11
J16
Q167 74F175PC
Q67 1S953
C63 0.1
C65 0.1
R161 75
R159 820
Q171 74S74
Q176
CLOCK2
Q167-9 (7/10)
CLOCK
Q129-3 (9/10)
CLOCK1
Q99-11 (6/10)
FRAMED H
Q107-9 (10/10)
R151 150
Q53 2SC1907
Q58 2SC2498
Q59 2SC2498
R154 150
C67 0.1
R149 150
R150 150
Q55 RDS.1E
R153 150
R155 820
R156 820
C150 0.1
R160 2.7K
R152 1K

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-4/10)

12

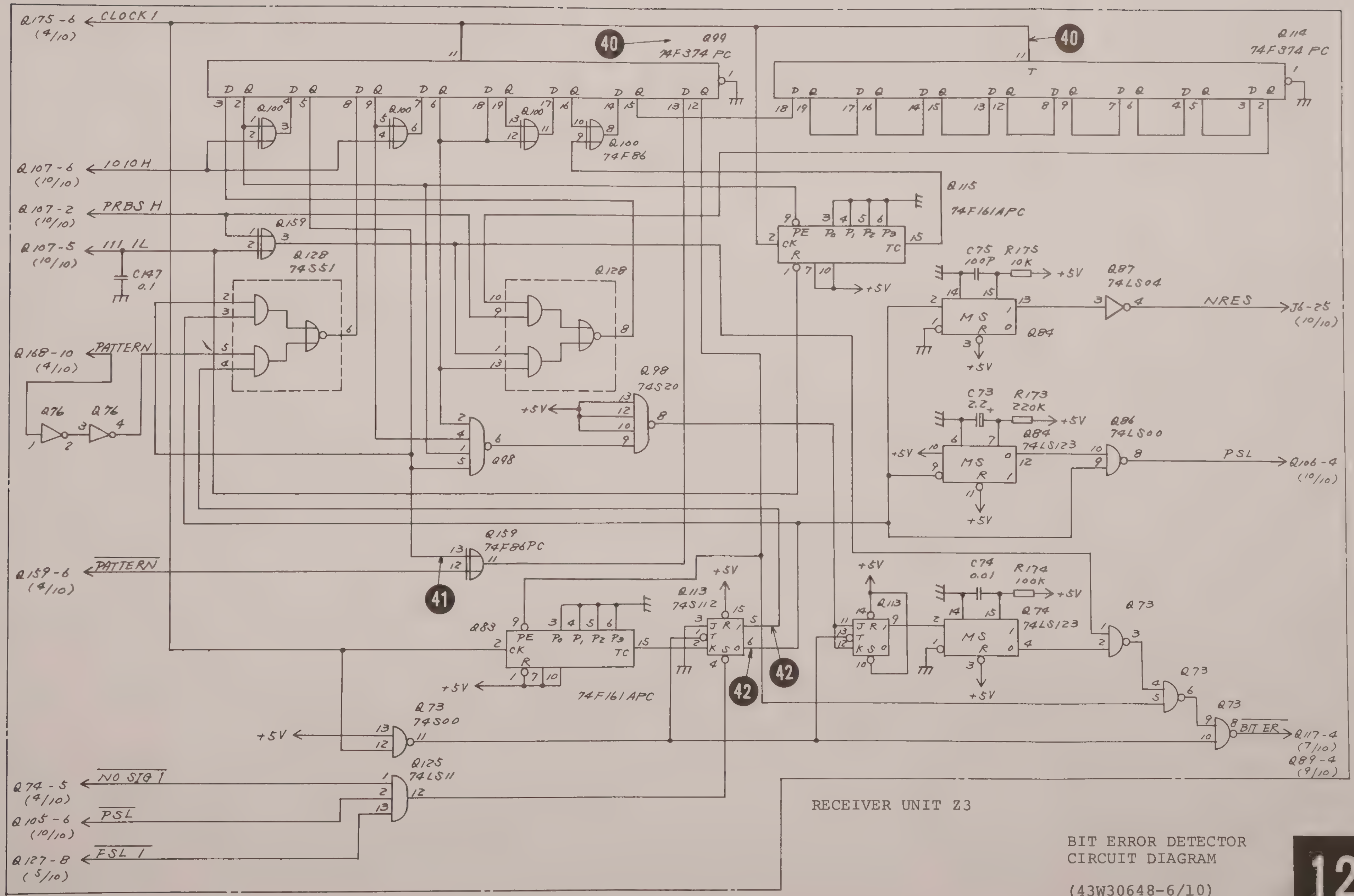

36
36′
37
38
39
Q107-9 (10/10) FRAMED H
Q165-11 (4/10) 1/85 CLK
Q174-5 (4/10) PARITY
Q174-9 (4/10) FRAME
Q156-9 (4/10) 1/85 RC
MFS Q75-4 (9/10)
FSL1 Q125-13 (6/10)
PAR ER Q87-13 (9/10)
XBIT Q75-9 (9/10)
INHIBIT Q157-3 (4/10)
FSL Q71-9 (4/5) Q106-2 (10/10)
74LS74A
74LS00
74LS175
74LS08
74LS10
74LS20
74LS86
74S74
74LS11
74LS163A
74LS112A
74LS123
Q140
Q141
Q103
Q127
Q94
Q96
Q79
Q102
Q80
Q82
Q111
Q112
Q126
Q110
Q95
Q125
Q156
Q97
Q72
Q81
Q71
C146 0.1
R184 470
C84 0.001
C72 4.7
R172 150K
MS
+5V

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-5/10)

12

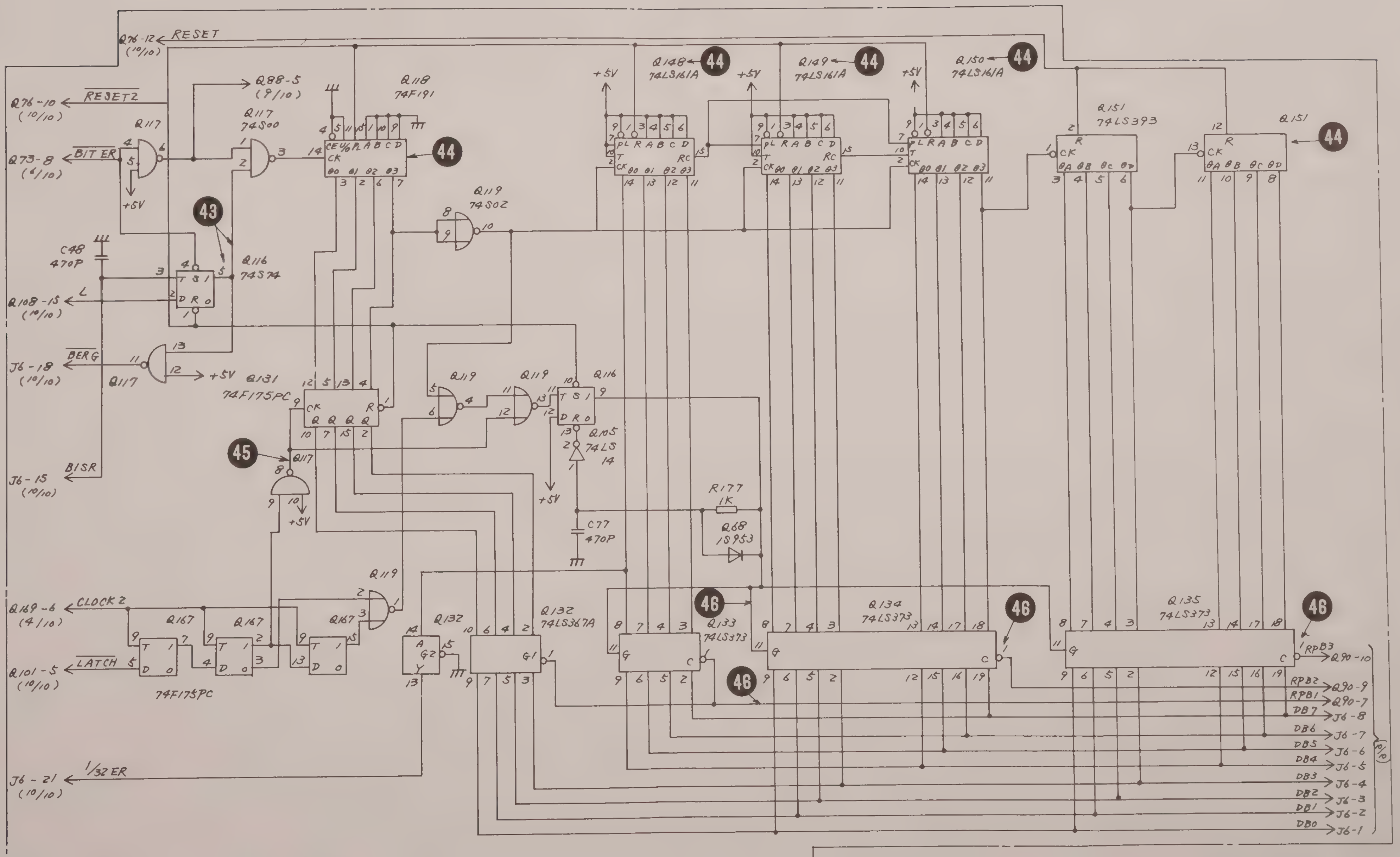

Q175-6 (4/10) CLOCK 1
40
Q99 74F374 PC
Q114 74F374 PC
Q100 74F86
Q107-6 (10/10) 1010H
Q107-2 (10/10) PRBS H
Q107-5 (10/10) 111 1L
C147 0.1
Q159
Q128 74S51
Q128
Q115 74F161APC
PE CK R P0 P1 P2 P3 TC
C75 100P
R175 10K
+5V
Q87 74LS04
NRES
J6-25 (10/10)
MS R
Q84
Q168-10 (4/10) PATTERN
Q76
Q98 74S20
Q98
C73 2.2
R173 220K
Q86 74LS00
Q84 74LS123
PSL
Q106-4 (10/10)
Q159 74F86PC
Q159-6 (4/10) PATTERN
41
Q83
74F161APC
Q113 74S112
J R T K S
42
Q113
C74 0.01
R174 100K
Q74 74LS123
Q73
Q73 74S00
Q125 74LS11
BIT ER
Q117-4 (7/10)
Q89-4 (9/10)
Q74-5 (4/10) NO SIG 1
Q105-6 (10/10) PSL
Q127-8 (5/10) FSL 1

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-6/10)

12

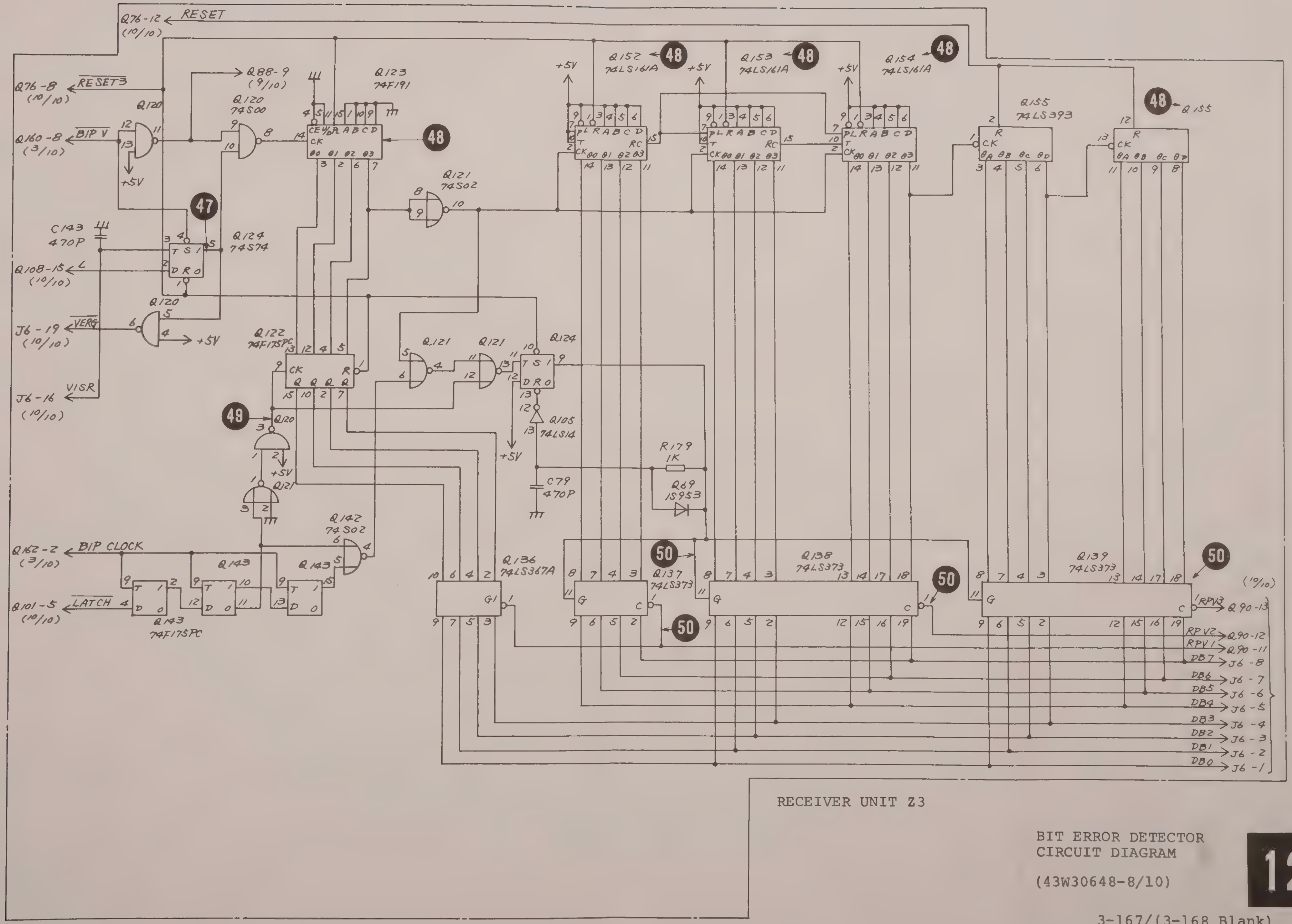

Q76-12 (10/10) RESET
Q76-10 (10/10) RESETZ
Q73-8 (6/10) BIT ER
Q108-15 (10/10) L
J6-18 (10/10) BERG
J6-15 (10/10) BISR
Q169-6 (4/10) CLOCK Z
Q101-5 (10/10) LATCH
J6-21 (10/10) 1/32 ER
Q88-5 (9/10)
Q117 74S00
Q116 74S74
C48 470P
Q118 74F191
Q119 74S02
Q131 74F175PC
Q105 74LS14
R177 1K
Q68 1S953
C77 470P
Q167 74F175PC
Q132
Q132 74LS367A
Q133 74LS373
Q134 74LS373
Q135 74LS373
Q148 74LS161A
Q149 74LS161A
Q150 74LS161A
Q151 74LS393
+5V
43
44
45
46
RPB3 Q90-10
RPB2 Q90-9
RPB1 Q90-7
DB7 J6-8
DB6 J6-7
DB5 J6-6
DB4 J6-5
DB3 J6-4
DB2 J6-3
DB1 J6-2
DB0 J6-1
(10/10)

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-7/10)

12

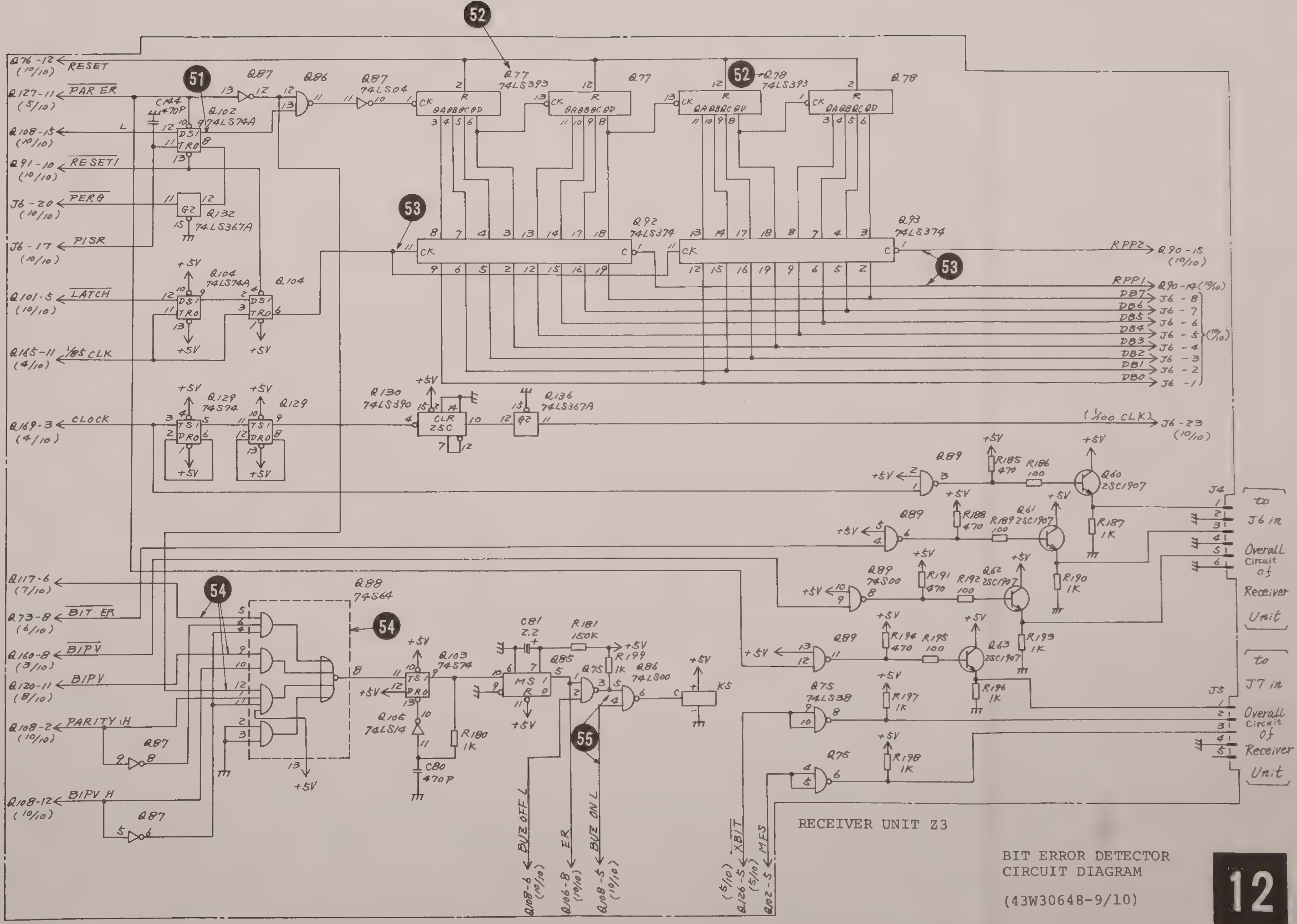

Q76-12 (10/10) RESET
Q76-8 (10/10) RESET3
Q160-8 (3/10) BIP V
Q120
Q120 74S00
Q88-9 (9/10)
Q123 74F191
Q124 74S74
C143 470P
Q108-15 (10/10)
J6-19 (10/10) VERG
J6-16 (10/10) VISR
Q122 74F175PC
Q121 74S02
Q121
Q124
Q105 74LS14
R179 1K
Q69 1S953
C79 470P
Q162-2 (3/10) BIP CLOCK
Q101-5 (10/10) LATCH
Q143 74F175PC
Q142 74S02
Q136 74LS367A
Q137 74LS373
Q138 74LS373
Q139 74LS373
Q152 74LS161A
Q153 74LS161A
Q154 74LS161A
Q155 74LS393
+5V
47
48
49
50
RPV3 Q90-13
RPV2 Q90-12
RPV1 Q90-11
DB7 J6-8
DB6 J6-7
DB5 J6-6
DB4 J6-5
DB3 J6-4
DB2 J6-3
DB1 J6-2
DB0 J6-1
(10/10)

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-8/10)

12

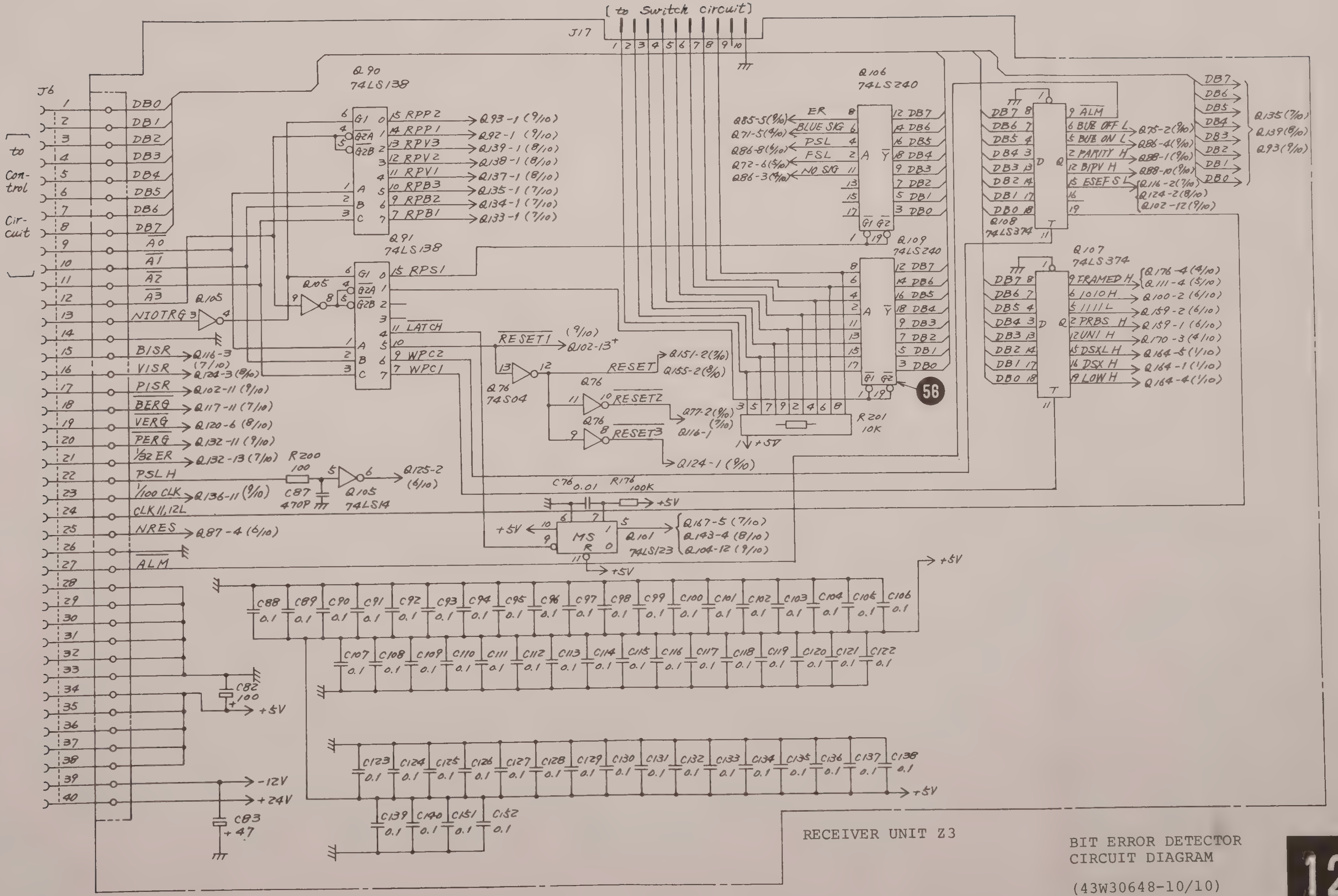

52
Q76-12 RESET (10/10)
51
Q127-11 PAR ER (5/10)
Q108-15 (10/10)
Q91-10 RESET1 (10/10)
J6-20 PERG (10/10)
J6-17 PISR (10/10)
Q101-5 LATCH (10/10)
Q165-11 1/85 CLK (4/10)
Q169-3 CLOCK (4/10)
C144 470P
Q102 74LS74A
Q132 74LS367A
Q104 74LS74A
Q104
Q129 74S74
Q129
Q87
Q86
Q87 74LS04
Q77 74LS393
Q77
Q78 74LS393
Q78
53
Q92 74LS374
Q93 74LS374
RPP2 Q90-15 (10/10)
RPP1 Q90-14 (10/10)
DB7 J6-8
DB6 J6-7
DB5 J6-6
DB4 J6-5 (10/10)
DB3 J6-4
DB2 J6-3
DB1 J6-2
DB0 J6-1
Q130 74LS390
Q136 74LS367A
(1/100 CLK) J6-23 (10/10)
Q89
R185 470
R186 100
Q60 2SC1907
R187 1K
R188 470
R189 100
Q61 2SC1907
R190 1K
Q89 74S00
R191 470
R192 100
Q62 2SC1907
R193 1K
R194 470
R195 100
Q63 2SC1907
R196 1K
Q75 74LS38
R197 1K
R198 1K
Q75
J4
to J6 in Overall Circuit of Receiver Unit
J5
to J7 in Overall Circuit of Receiver Unit
Q117-6 (7/10)
Q73-8 BIT ER (6/10)
Q160-8 BIPV (3/10)
Q120-11 BIPV (8/10)
Q108-2 PARITY H (10/10)
Q108-12 BIPV H (10/10)
54
Q88 74S64
Q103 74S74
Q105 74LS14
R180 1K
C80 470P
C81 2.2
R181 150K
R199 1K
Q85
Q75
Q86 74LS00
K5
55
BUZ OFF L Q108-6 (10/10)
ER Q106-8 (10/10)
BUZ ON L Q108-5 (10/10)
XBIT Q126-5 (5/10)
MFS Q102-5 (5/10)
+5V

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-9/10)

12

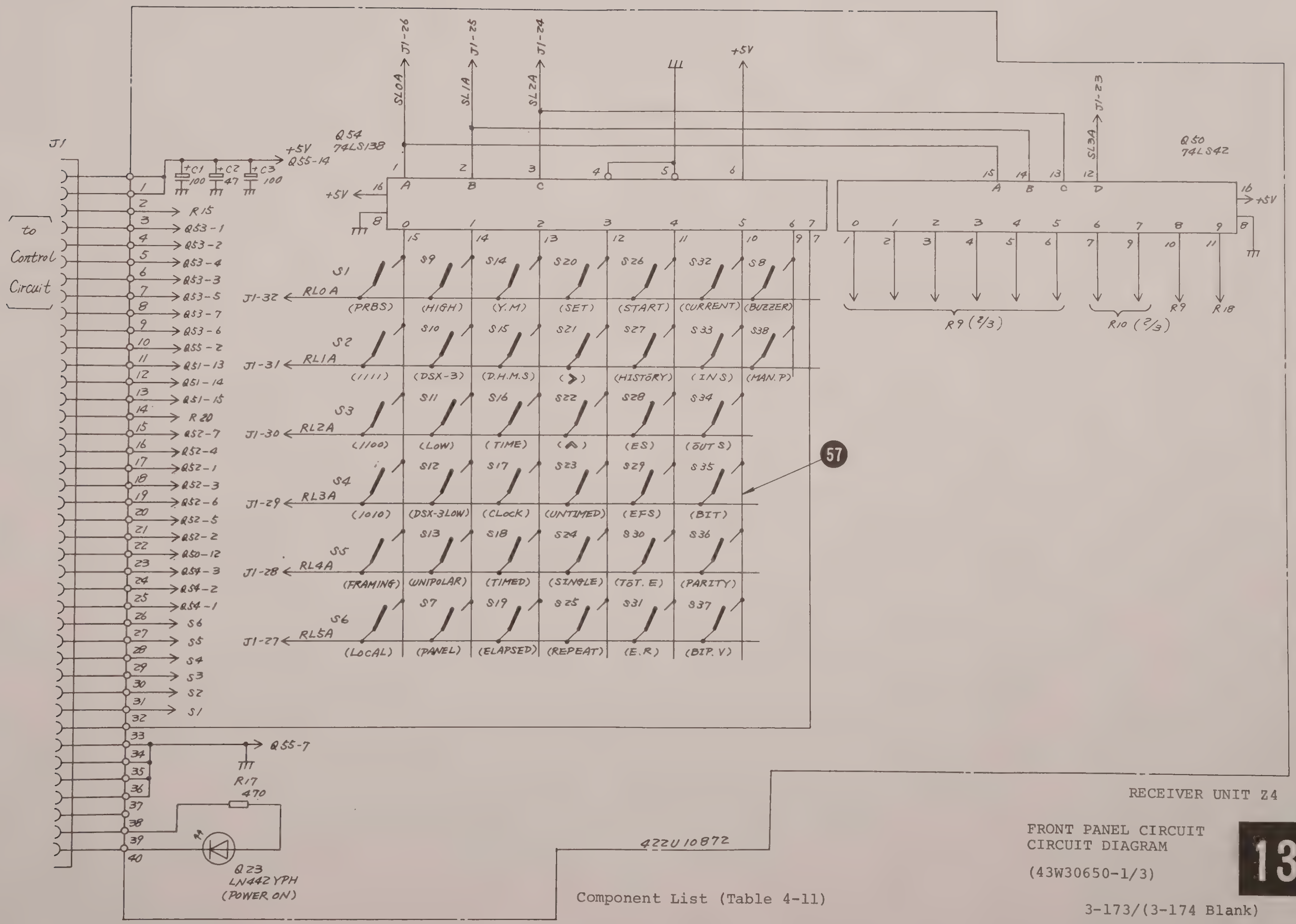

(to Switch circuit)
J17
J6
to Control Circuit
Q90 74LS138
Q91 74LS138
Q105
Q106 74LS240
Q109 74LS240
Q108 74LS374
Q107 74LS374
Q76 74S04
Q101 74LS123
Q105 74LS14
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
A0
A1
A2
A3
NIOTRG
BISR
VISR
PISR
BERG
VERG
PERG
1/32 ER
PSL H
1/100 CLK
CLK 11,12L
NRES
ALM
RPP2
RPP1
RPV3
RPV2
RPV1
RPB3
RPB2
RPB1
RPS1
LATCH
WPC2
WPC1
RESET1
RESET
RESET2
RESET3
ER
BLUE SIG
PSL
FSL
NO SIG
ALM
BUE OFF L
BUE ON L
PARITY H
BIPV H
ESEF S L
FRAMED H
1010 H
1111 L
PRBS H
UNI H
DSXL H
DSX H
LOW H
Q93-1 (9/10)
Q92-1 (9/10)
Q139-1 (8/10)
Q138-1 (8/10)
Q137-1 (8/10)
Q135-1 (7/10)
Q134-1 (7/10)
Q133-1 (7/10)
Q102-13 (9/10)
Q151-2 (7/10)
Q155-2 (8/10)
Q77-2 (9/10)
Q116-1 (7/10)
Q124-1 (9/10)
Q116-3 (7/10)
Q124-3 (8/10)
Q102-11 (9/10)
Q117-11 (7/10)
Q120-6 (8/10)
Q132-11 (9/10)
Q132-13 (7/10)
Q136-11 (9/10)
Q87-4 (6/10)
Q125-2 (6/10)
Q85-5 (9/10)
Q71-5 (4/10)
Q86-8 (6/10)
Q72-6 (5/10)
Q86-3 (4/10)
Q75-2 (9/10)
Q86-4 (9/10)
Q88-1 (9/10)
Q88-10 (9/10)
Q116-2 (7/10)
Q124-2 (8/10)
Q102-12 (9/10)
Q135 (7/10)
Q139 (8/10)
Q93 (9/10)
Q176-4 (4/10)
Q111-4 (5/10)
Q100-2 (6/10)
Q159-2 (6/10)
Q159-1 (6/10)
Q170-3 (4/10)
Q164-5 (1/10)
Q164-1 (1/10)
Q164-4 (1/10)
Q167-5 (7/10)
Q143-4 (8/10)
Q104-12 (9/10)
R200 100
C87 470P
C76 0.01
R176 100k
R201 10K
MS
C82 100
C83 47
+5V
-12V
+24V
C88 … C122 0.1
C123 … C138 0.1
C139 C140 C151 C152 0.1
56

RECEIVER UNIT Z3

BIT ERROR DETECTOR
CIRCUIT DIAGRAM

(43W30648-10/10)

12


J1
to Control Circuit
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
R15
Q53-1
Q53-2
Q53-4
Q53-3
Q53-5
Q53-7
Q53-6
Q55-2
Q51-13
Q51-14
Q51-15
R20
Q52-7
Q52-4
Q52-1
Q52-3
Q52-6
Q52-5
Q52-2
Q50-12
Q54-3
Q54-2
Q54-1
S6
S5
S4
S3
S2
S1
Q55-7
R17
470
Q23
LN442YPH
(POWER ON)
C1 100
C2 47
C3 100
+5V
Q55-14
Q54
74LS138
SL0A
J1-26
SL1A
J1-25
SL2A
J1-24
+5V
SL3A
J1-23
Q50
74LS42
A
B
C
D
R9 (2/3)
R10 (2/3)
R9
R18
J1-32 RL0A
J1-31 RL1A
J1-30 RL2A
J1-29 RL3A
J1-28 RL4A
J1-27 RL5A
S1 (PRBS)
S9 (HIGH)
S14 (Y.M)
S20 (SET)
S26 (START)
S32 (CURRENT)
S8 (BUZZER)
S2 (////)
S10 (DSX-3)
S15 (D.H.M.S)
S21 (>)
S27 (HISTORY)
S33 (INS)
S38 (MAN.P)
S3 (/100)
S11 (LOW)
S16 (TIME)
S22 (^)
S28 (ES)
S34 (OUT S)
S4 (1010)
S12 (DSX-3LOW)
S17 (CLOCK)
S23 (UNTIMED)
S29 (EFS)
S35 (BIT)
S5 (FRAMING)
S13 (UNIPOLAR)
S18 (TIMED)
S24 (SINGLE)
S30 (TOT. E)
S36 (PARITY)
S6 (LOCAL)
S7 (PANEL)
S19 (ELAPSED)
S25 (REPEAT)
S31 (E.R)
S37 (BIP. V)
57
422U10872

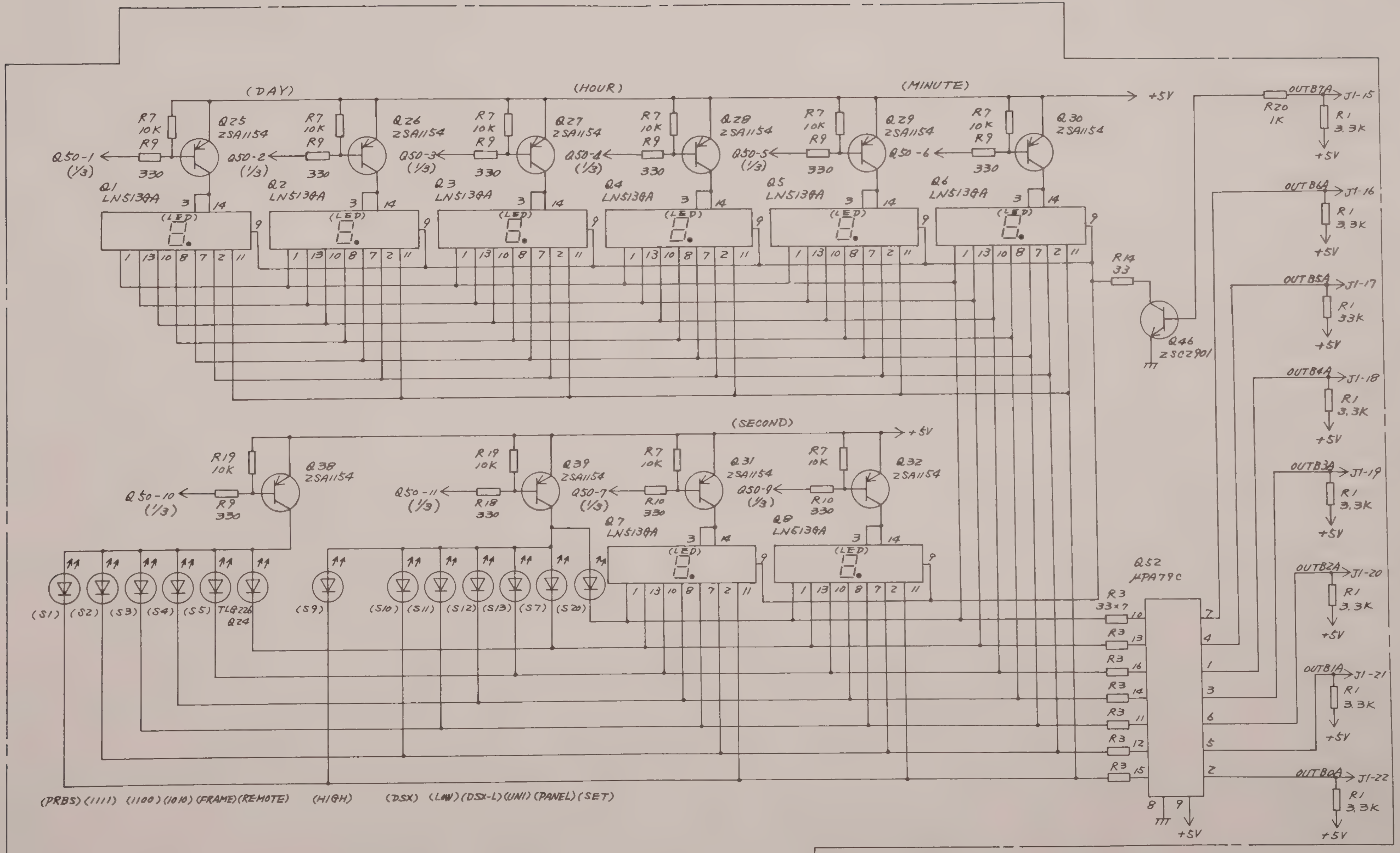
Component List (Table 4-11)

RECEIVER UNIT Z4

FRONT PANEL CIRCUIT
CIRCUIT DIAGRAM

(43W30650-1/3)

13

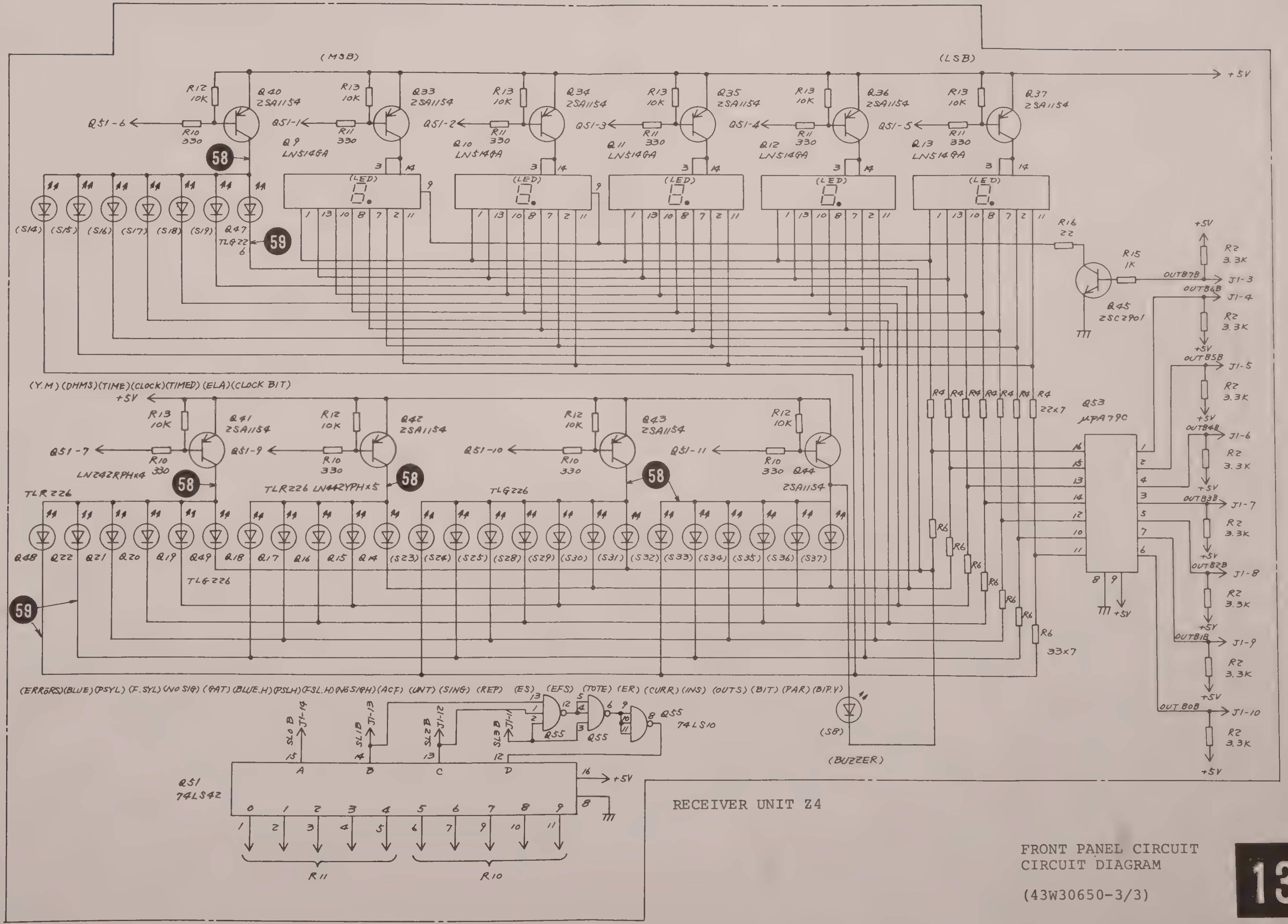

(DAY)
(HOUR)
(MINUTE)
(SECOND)
+5V
R7 10K
R9 330
Q25 2SA1154
Q26 2SA1154
Q27 2SA1154
Q28 2SA1154
Q29 2SA1154
Q30 2SA1154
Q50-1 (1/3)
Q50-2 (1/3)
Q50-3 (1/3)
Q50-4 (1/3)
Q50-5 (1/3)
Q50-6
Q1 LN513GA
Q2 LN513GA
Q3 LN513GA
Q4 LN513GA
Q5 LN513GA
Q6 LN513GA
(LED)
3
14
9
1 13 10 8 7 2 11
R20 1K
OUTB7A
J1-15
OUTB6A
J1-16
OUTB5A
J1-17
OUTB4A
J1-18
OUTB3A
J1-19
OUTB2A
J1-20
OUTB1A
J1-21
OUTB0A
J1-22
R1 3.3K
R14 33
Q46 2SC2901
R19 10K
Q38 2SA1154
Q50-10 (1/3)
R9 330
Q50-11 (1/3)
R18 330
Q39 2SA1154
Q50-7 (1/3)
R10 330
Q31 2SA1154
Q50-9 (1/3)
Q32 2SA1154
Q7 LN513GA
Q8 LN513GA
(S1) (S2) (S3) (S4) (S5)
TLG226 Q24
(S9)
(S10) (S11) (S12) (S13) (S7) (S20)
(PRBS) (1111) (1100) (1010) (FRAME) (REMOTE)
(HIGH)
(DSX) (LOW) (DSX-L) (UNI) (PANEL) (SET)
Q52 μPA79C
R3 33×7
10 13 16 14 11 12 15
7 4 1 3 6 5 2
8 9

RECEIVER UNIT Z4

FRONT PANEL CIRCUIT
CIRCUIT DIAGRAM

(43W30650-2/3)

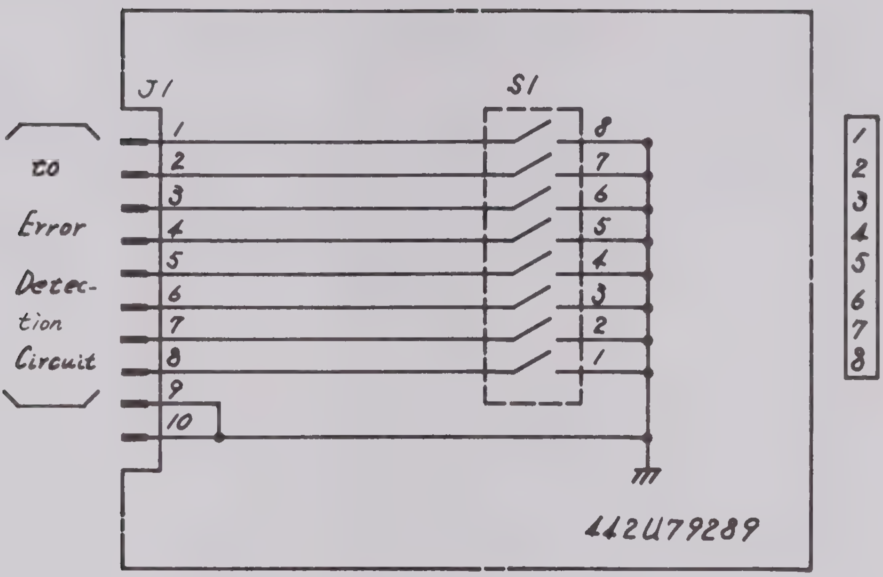
13


(MSB)
(LSB)
+5V
R12 10K
R13 10K
R10 330
R11 330
Q40 2SA1154
Q33 2SA1154
Q34 2SA1154
Q35 2SA1154
Q36 2SA1154
Q37 2SA1154
Q51-6
Q51-1
Q51-2
Q51-3
Q51-4
Q51-5
Q9 LN514GA
Q10 LN514GA
Q11 LN514GA
Q12 LN514GA
Q13 LN514GA
(LED)
58
59
(S14) (S15) (S16) (S17) (S18) (S19)
Q47 TLG226
R16 22
R15 1K
Q45 2SC2901
OUTB7B
OUTB6B
OUTB5B
OUTB4B
OUTB3B
OUTB2B
OUTB1B
OUT B0B
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
J1-9
J1-10
R2 3.3K
R4 22×7
R6 33×7
Q53 μPA79C
(Y.M) (DHMS) (TIME) (CLOCK) (TIMED) (ELA) (CLOCK BIT)
Q41 2SA1154
Q42 2SA1154
Q43 2SA1154
Q44 2SA1154
Q51-7
Q51-9
Q51-10
Q51-11
LN242RPH×4
TLR226 LN442YPH×5
TLR226
TLG226
Q48 Q22 Q21 Q20 Q19 Q49 Q18 Q17 Q16 Q15 Q14 (S23) (S24) (S25) (S28) (S29) (S30) (S31) (S32) (S33) (S34) (S35) (S36) (S37)
(ERRORS) (BLUE) (PSYL) (F.SYL) (NO SIG) (PAT) (BLUE.H) (PSLH) (FSL.H) (NOSIGH) (ACF) (UNT) (SING) (REP) (ES) (EFS) (TOTE) (ER) (CURR) (INS) (OUTS) (BIT) (PAR) (BIP.V)
SL0B J1-14
SL1B J1-13
SL2B J1-12
SL3B J1-11
Q55
Q55 74LS10
(S8)
(BUZZER)
Q51 74LS42
A B C D
0 1 2 3 4 5 6 7 8 9
R11
R10
RECEIVER UNIT Z4

FRONT PANEL CIRCUIT
CIRCUIT DIAGRAM

(43W30650-3/3)

13


J1
S1
to
Error
Detec-
tion
Circuit
1
2
3
4
5
6
7
8
9
10
8
7
6
5
4
3
2
1
1
2
3
4
5
6
7
8
442U79289

Component List (Table 4-12)

SWITCH CIRCUIT
CIRCUIT DIAGRAM

(44W79291-1/1)

SECTION 4

REPLACEABLE PARTS

4.1 Introduction

This section contains information relative to ordering replacement components. The following table shows circuit references (hereinafter CKT REF) and abbreviations used for components given in the component list. In the component list, the quantity of each component is "1" when no quantity is given in the "NOTE" column.

(1) Circuit reference

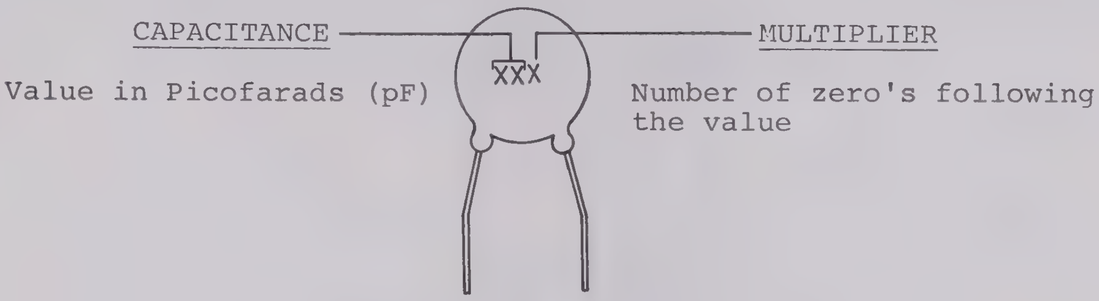
AT: Attenuator
C: Capacitor
F: Fuse
G: Fan
J: Jack, plug connector
K: Relay
L: Coil
M: Meter, timer
P: Lamp
Q: Transistor, Diode, Rectifier, IC
R: Resistor
S: Switch
T: Transformer
V: Neon lamp, Vaccumtube
Z: Unit

(2) Abbreviations

A	: amperes
Att, R var	: attenuator variable using film resistive elements
BL	: boundary layer
Cer	: ceramic
CF	: carbon film
Comp	: composition
CRT	: cathode-ray tube
Di	: diode
DIL type	: dual-in line type
Elect	: electrolyte aluminum
F	: farad
FET	: field effect transistor
G	: ground
Ge	: germanium
H	: henry
Hz	: hertz
IC	: integrated circuit
IEC	: Applicable to IEC Safety Standard
J-FET	: junction FET
k	: kilo ($\times 10^3$)
LED	: light emitting diode
M	: mega ($\times 10^6$)
m	: milli ($\times 10^{-3}$)
MF	: metallized film
MOS-FET	: metal oxide semi-conductor FET
M paper	: metallized paper
M plast	: metallized plastic film
Multi	: multiplying
N ch	: N channel
non-lin	: non-linear taper
Non-pol	: non-polarity
NPN	: negative-positive-negative
Ω	: ohms
p	: pico ($\times 10^{-12}$)
Plast	: plastic film
PMTR	: potentiometer
PNP	: positive-negative-positive
p-p, pp	: peak to peak value
RFC	: RF choke
R-lamp	: resistor lamp
rms	: effective value (root means square)
SBD	: shottky barrier diode
SCR	: sillicon controlled rectifier
Si	: sillicon
SRD	: step recovery diode
Tant	: tantalum
Tr	: transistor
Trans	: transformer
μ	: micro ($\times 10^{-6}$)
V	: volt
Var	: variable
WW	: wire wound
XTAL	: crystal

4.2 Capacitor/Resistor Reading Method

4.2.1 Capacitor

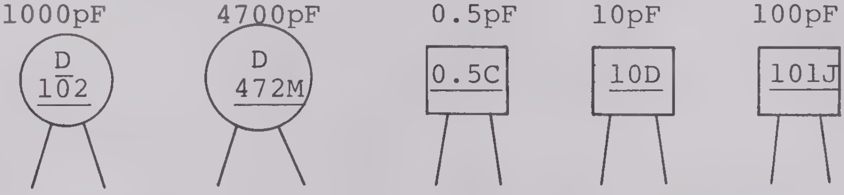

CAPACITANCE
Value in Picofarads (pF)
XXX
MULTIPLIER
Number of zero's following the value

EXAMPLES: 103 = 10,000pF = 10^{-8}F or 0.01μF
302 = 3,000pF = 3×10^{-9}F or 0.003μF
676 = 67,000,000pF = 67×10^{-6}F or 67μF

(a) Ceramic capacitor, polyester capacitor

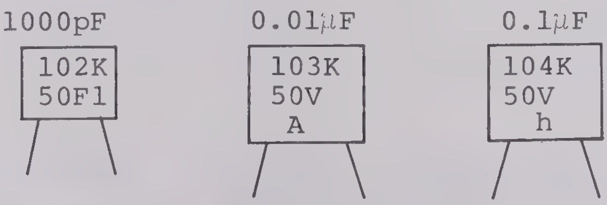
Indication	0.5	1	10	101	102	103	104
Capacity	0.5pF	1pF	10pF	100pF	1000pF	0.01μF	0.1μF

Example:
Ceramic Capacitor


1000pF
D
102
4700pF
D
472M
0.5pF
0.5C
10pF
10D
100pF
101J

Capacity values are always underlined.

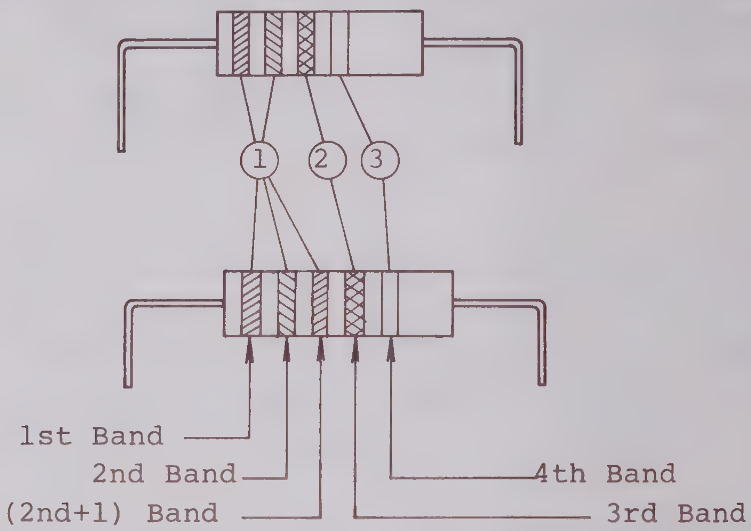
Polyester Capacitor


1000pF
102K
50F1
0.01μF
103K
50V
A
0.1μF
104K
50V
h

(b) Tantalum capacitor. Metallized capacitor and Electrolytic capacitor

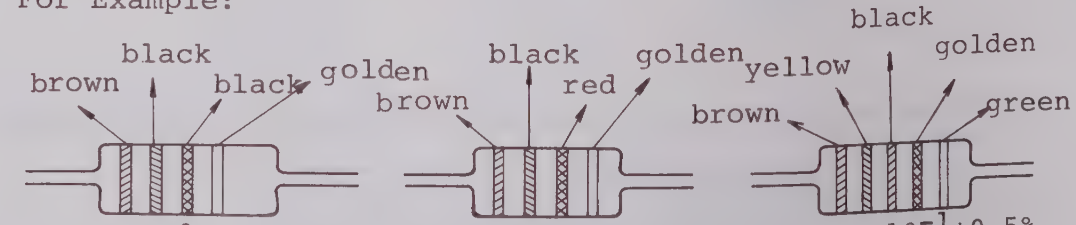
Indication	OR47	010	100	101
Capacity	0.47μF	1μF	10μF	100μF

4.2.2 Resistor


①
②
③
1st Band
2nd Band
(2nd+1) Band
4th Band
3rd Band

COLOR	① Figure		② Multiplier	③ Tolerance
	1st	2nd	3rd	4th
Black	0	0	$x10^{0}$	-
Brown	1	1	$x10^{1}$	-
Red	2	2	$x10^{2}$	-
Orange	3	3	$x10^{3}$	-
Yellow	4	4	$x10^{4}$	-
Green	5	5	$x10^{5}$	$\pm0.5\%$
Blue	6	6	$x10^{6}$	-
Purple	7	7	$x10^{7}$	-
Grey	8	8	$x10^{8}$	-
White	9	9	$x10^{9}$	-
Gold	-	-	$x10^{-1}$	$\pm5\%$
Silver	-	-	$x10^{-2}$	$\pm10\%$
-----	-	-		$\pm20\%$

For Example:


black
brown
black
golden
black
golden
red
brown
black
golden
yellow
green
brown

$10x10^{0}\pm5\%$ $10x10^{2}\pm5\%$ $140x10^{-1}\pm0.5\%$

$10\Omega, \pm5\%$ $1k\Omega, \pm5\%$ $14.0\Omega, \pm0.5\%$

4.3 Ordering Information

When ordering components, please give the following information by referring to the Component List.

Item		Example
(1)	Name of instrument	DS-3 TRANSMISSION ANALYZER ME462B RECEIVER
(2)	Name of component	Component List of Control Circuit (Z2)
(3)	CKT REF	C38
(4)	Name of component	ECQ-M1H 104KZ Note: The part name is given in parentheses ( ) in the Component List. Components with asterisks * require factory adjustment upon repairing. When ordering a component or components with asterisks, give a full description of the component.
(5)	Quantity	1
(6)	Serial No. of instrument	M31257

4.4 Component List

The Component List of ME462B follows from Table 4-1 to Table 4-12 for the Transmitter and the Receiver. (Including for OPT.)

Table No.	Name	Schematic No.
Table 4-1	Transmitter Unit	3
Table 4-2	(Transmitter, Z2) Power Supply	4
Table 4-3	(Transmitter, Z3) PATTERN Generator	5
Table 4-4	(Transmitter, Z4) Front Panel	6
Table 4-5	(Transmitter, Z5) OPTION 01 to 04	7
Table 4-6	(Transmitter, Z6, or Receiver, Z6) GP-IB Interface	8
Table 4-7	(Transmitter, Z7, or Receiver, Z7) RS-232C Interface	9
Table 4-8	Receiver Unit	10
Table 4-9	(Receiver, Z3) ERROR DETECTION	11
Table 4-10	(Receiver, Z2) CONTROL Circuit	12
Table 4-11	(Receiver, Z4) Front Panel	13
Table 4-12	(Receiver, Z8) Switch Circuit	14

Table 4-1 COMPONENT LIST FOR ME462B TRANSMITTER UNIT (Transmitter Unit Circuit Diagram 3)

CKT REF	DESCRIPTION	RATING		NOTE
G 1	Fan,(FB08B12L)			
J 1	Not assigned			
J 2	Socket,(DF1-10S-2.5R24)			
J 3	Terminal,(34E5848)			
J 4	Terminal,(34E5848)			
J 5	Terminal,(A-12)			
J 6	Socket,(DF1-15S-2.5R24)			
J 7	Receptacle,(BNC-R-NI)			
J 8	Receptacle,(BNC-R-NI)			
J 9	Receptacle,(BNC-R-NI)			
J10	Receptacle,(BNC-R-NI)			
J11	Receptacle,(BNC-R-NI)			
J12	Connector,(HIF35-34D-AA40S)			
R 1	CF,(ARD25T391J)	390Ω,±5%,1/4W		
S 1	Switch,(ESB-9997S16)			
S 2	Toggle,(8E3011)			
S 3	Toggle,(8A2011)			
T 1	Power trans,(44T80042)			
Z 1	Inlet			****A (See Note.)
Z 2	POWER SUPPLY CIRCUIT			
Z 3	PATTERN GENERATOR CIRCUIT			
Z 4	FRONT PANEL CIRCUIT			
Z 5	CLOCK CIRCUIT			OPT 01 to 04
Z 6	GP-IB INTERFACE			OPT 21
Z 7	RS-232C INTERFACE			OPT 22

( ): Manufacturer's part number
* : Selected at factory

Table 4-2 COMPONENT LIST FOR POWER SUPPLY CIRCUIT
(422U10935 P.C. BOARD), (Transmitter Z2 Circuit Diagram 4)

CKT REF	DESCRIPTION	RATING		NOTE
C 1	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 2	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 3	Elect,(CE04C1C330)	33μF,±20%,16V		
C 4	Elect,(CE04C1C330)	33μF,±10%,16V		
C 5	Elect,(ECEM80R682L)	6800μF,±15%,80V		
C 6	Not assigned			
C 7	Not assigned			
C 8	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 9	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C10	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C11	Elect,(ECEA1HG221S)	220μF,+50/-20%,50V		
C12	Elect,(ECEA1CG222S)	2200μF,+50/-20%,16V		
C13	Elect,(ECEA1CG102S)	1000μF,+50/-20%,16V		
C14	Elect,(ECEA1AG102S)	1000μF,+50/-20%,10V		
C15	Elect,(ECEA1HG471S)	470μF,+50/-20%,50V		
C16	Elect,(ECEA1HG471S)	470μF,+50/-20%,50V		
C17	Elect,(CE04C1J101)	100μF,±20%,63V		
C18	Not assigned			
C19	Not assigned			
C20	Not assigned			
C21	Elect,(CE04C1J4R7)	4.7μF,±20%,63V		
C22	Cer,(CK924C1H * M)	0.001 to 0.01μF,±20%, 50V		Q'ty 0 to 2, *
C23	Cer,(CK924C1H * M)	0.001 to 0.1μF,±20%, 50V		Q'ty 0 to 2, *
C24	Elect,(CE04C1J2R2)	2.2μF,±20%,63V		
C25	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		Q'ty 0 to 3
C26	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C27	Elect,(ECEA1AG102S)	1000μF,+50/-20%,10V		
C28	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C29	Elect,(CE04C1A470)	47μF,±20%,10V		
C30	Elect,(CE04C1J2R2)	2.2μF,±20%,63V		
C31	Not assigned			
C32	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C33	Not assigned			
C34	Not assigned			
C35	Cer,(CC924CH1H221J)	220pF,±5%,50V		
C36	Plast,(ECQ-P1 * FZ)	0.001 to 0.0168μF, ±1%,100V		Q'ty 0 or 1, *
C37 to C50	Not assigned			
C51	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C52	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C53	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C54	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		

B

( ): Manufacturer's part number
* : Selected at factory

Table 4-2 COMPONENT LIST FOR POWER SUPPLY CIRCUIT (422U10935 P.C. BOARD), (Transmitter Z2 Circuit Diagram 4)

CKT REF	DESCRIPTION	RATING		NOTE
C55	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C56	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C57	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C58	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C59	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C60	Not assigned			
C61	Cer,(CK924C1H * M)	0.001 to 0.1μF,±20%, 50V		Q'ty 0 to 2, *
C62	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C63	Elect,(CE04C1J2R2)	2.2μF,±20%,63V		
C64	Elect,(CE04C1J2R2)	2.2μF,±20%,63V		
C65	Elect,(CE04C1J4R7)	4.7μF,±20%,63V		
C66	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C67	Elect,(CE04C1J4R7)	4.7μF,±20%,63V		
C68	Plast,(ECQ-P1 153FZ)	0.015μF,±1%,100V		
C69	Elect,(CE04C1E220)	22μF,±20%,25V		
C70	Cer,(RPE111CH * G50)	100 to 680pF,±2%,50V		*
C71	Cer,(CK924C1H472M)	4700pF,±20%,50V		
C72	Cer,(CC924C1H103M)	0.01μF,±20%,50V		
C73	Cer,(CC924C1H104M)	0.1μF,±20%,50V		
F 1	Fuse,(MF51NN240V5ADC01)	5A		
F 2	Fuse,(MF51NN250V5ADC01)	5A		
F 3	Fuse,(MF51NN250V1ADC01)	1A		
F 4	Fuse,(MF51NN250V1ADC01)	1A		
F 5	Fuse,(MF51NN250V1.6A DC01)	1.6A		
F 6	Fuse,(SF-96U)	96°C,10A,250V		
J 1	Connector,(DF1-10P-2.5DSA)			
J 2	Connector,(HIF3-26P-2.54DSA)			
J 3	Connector,(HIF3-40P-2.54DSA)			
J 4	Connector,(HIF3-34P-2.54DSA)			
K 1	Relay,(G2L-113P-V)			
L 1	Coil,(SKL-202A)	50μH		
L 2	Coil,(SC-10-100)	1mH		
L 3	Coil,(HP-023)	300μH		
L 4	Coil,(HP-023)	300μH		
L 5	Coil,(LH1-471K)	470μH		

( ): Manufacturer's part number

* : Selected at factory

Table 4-2 COMPONENT LIST FOR POWER SUPPLY CIRCUIT (422U10935 P.C. BOARD), (Transmitter Z2 Circuit Diagram 4)

CKT REF	DESCRIPTION	RATING		NOTE
L 6	Coil,(SKL-103A)	100μH		
M 1	Timer,(TM-0)	5000H		
Q 1	IC,(μPC451C)			
Q 2	Di,breakdown,(02BZ2.2)	1.88 to 2.56V,250mW		
Q 3	Rectifier,(D5FB20)			
Q 4	Not assigned			
Q 5	IC,(μPC14312H)			
Q 6	IC,(μPC16312H)			
Q 7	Di, breakdown,(RD5.1E)	4.8 to 5.37V,400mW		
Q 8	Not assigned			
Q 9	Not assigned			
Q10	Di,(S10SC4M)			
Q11	Not assigned			
Q12	Tr,(2SC1008)			
Q13	Di,(VO3G)			
Q14	Photo coupler,(PC618)			
Q15	Di,breakdown,(RD13E)	12.11 to 13.66V, 400mW		
Q16	Not assigned			
Q17	Di,(1S955)			
Q18	Di,(1S955)			
Q19	Tr,(2SA780A)			
Q20	Tr,(2SA780A)			
Q21	IC,(μPC1042C)			
Q22	Di,(1S953)			
Q23	Not assigned			
Q24	Di,(1S955)			
Q25	Di,(1S955)			
Q26	Di,(VO3G)			
Q27	Di,(1S955)			
Q28	Di,(1S955)			
Q29	Di,(VO3G)			
Q30	Tr,(2SC3164)			
Q31	Tr,(2SC3164)			
Q32	Di,(S5KC20H)			
Q33	Di,(S10SC4MR)			
Q34	Di,(S5KC20HR)			
Q35	Di,(S5KC20H)			
Q36	Di,(1S1300)			
Q37 to Q48	Not assigned			
Q49	IC,(μPD8255AC-2)			

B

( ): Manufacturer's part number

* : Selected at factory

Table 4-2 COMPONENT LIST FOR POWER SUPPLY CIRCUIT (422U10935 P.C. BOARD), (Transmitter Z2 Circuit Diagram 4)

CKT REF	DESCRIPTION	RATING		NOTE
Q50	IC, (HM6116LP-3)			
Q51	IC, (74LS365A)			
Q52	IC, (74LS245)			
Q53	IC, (μPD8279C-2)			
Q54	Not assigned			
Q55	IC, (74LS14)			
Q56	IC, (74LS365A)			
Q57	IC, (μPD8253C-2)			
Q58	IC, (74LS04)			
Q59	IC, (MBM2764-25)			
Q60	IC, (74LS42)			
Q61	IC, (74LS365A)			
Q62	IC, (74LS32)			
Q63	IC, (TC40H004P)			
Q64	IC, (74LS74A)			
Q65	IC, (7437)			
Q66	IC, (μPD780C)			
Q67	Not assigned			
Q68	IC, (74LS00)			
Q69	IC, (TL7705CP)			
Q70	IC, (74LS27)			
Q71	IC, (74LS74A)			
Q72	IC, (1S953)			
Q73	Rectifier, (RB-152-LFB)			
Q74	Photo coupler, (PC614)			
Q75	IC, (TC4011BP)			
Q76	Di, (1SS99)			
Q77	IC, (8038ACJD)			
Q78	Tr, (2SC2718)			
Q79	IC, (74LS123)			
Q80	Tr, (2SC2718)			
R 1	Not assigned			
R 2	Not assigned			
R 3	CF, (ARD25T560J)	56Ω, ±5%, 1/4W		
R 4	Not assigned			
R 5	CF, (ARD25T103J)	10kΩ, ±5%, 1/4W		
R 6	CF, (ARD25T * J)	4.7k to 100kΩ, ±5%, 1/4W		Q'ty 1 to 3, *
R 7	CF, (ARD25T471J)	470Ω, ±5%, 1/4W		
R 8	CF, (ARD25T * J)	10kΩ to 1MΩ, ±5%, 1/4W		Q'ty 1 to 3, *
R 9	CF, (ARD25T331J)	330Ω, ±5%, 1/4W		
R10	MF, (RS1FB 4.7kΩJ)	4.7kΩ, ±5%, 1W		
R11	CF, (ARD25T151J)	150Ω, ±5%, 1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-2 COMPONENT LIST FOR POWER SUPPLY CIRCUIT (422U10935 P.C. BOARD), (Transmitter Z2 Circuit Diagram 4)

CKT REF	DESCRIPTION	RATING		NOTE
R12	MF,(RN14K2H332J)	3.3kΩ,±5%,1/2W		
R13	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R14	CF,(ERF-5SK-3R3)	3.3Ω,±10%,5W		
R15	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R16	Not assigned			
R17	Not assigned			
R18	Not assigned			
R19	Not assigned			
R20	Not assigned			
R21	Not assigned			
R22	CF,(ARD25T * J)	1k to 100kΩ,±5%,1/4W		Q'ty 1 to 3, *
R23	CF,(ARD25T473J)	47kΩ,±5%,1/4W		
R24	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R25	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R26	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R27	CF,(ARD25T * J)	22k to 100kΩ,±5%, 1/4W		Q'ty 1 to 3, *
R28	Not assigned			
R29	Not assigned			
R30	CF,(ARD25T223J)	22kΩ,±5%,1/4W		
R31	CF,(ARD25T473J)	47kΩ,±5%,1/4W		
R32	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R33	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R34	CF,(ARD25T470J)	47Ω,±5%,1/4W		
R35	CF,(ARD25T * J)	6.8 to 22Ω,±5%,1/4W		Q'ty 0 to 2, *
R36	CF,(ARD25T * J)	10 to 100Ω,±5%,1/4W		Q'ty 1 or 2, *
R37	CF,(ARD25T470J)	47Ω,±5%,1/4W		
R38	CF,(ARD25T * J)	6.8 to 22Ω,±5%,1/4W		Q'ty 0 to 2, *
R39	CF,(ARD25T * J)	10 to 100Ω,±5%,1/4W		Q'ty 1 or 2, *
R40	Not assigned			
R41	Not assigned			
R42	Not assigned			
R43	CF,(ARD25T * J)	10k to 100kΩ,±5%, 1/4W		Q'ty 0 or 1, *
R44	Not assigned			
R45	Not assigned			
R46	Not assigned			
R47	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R48	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R49	CF,(ARD25T105J)	1MΩ,±5%,1/4W		
R50	Not assigned			

( ): Manufacturer's part number

* : Selected at factory

Table 4-2 COMPONENT LIST FOR POWER SUPPLY CIRCUIT (422U10935 P.C. BOARD), (Transmitter Z2 Circuit Diagram 4)

CKT REF	DESCRIPTION	RATING		NOTE
R51	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		
R52	Not assigned			
R53	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		
R54	CF,(ARD25T105J)	1MΩ,±5%,1/4W		
R55	Not assigned			
R56	Not assigned			
R57	CF,(ARD25T121J)	120Ω,±5%,1/4W		
R58	MF,(RN14K2H332J)	3.3kΩ,±5%,1/2W		
R59	Not assigned			
R60	MF,(RS1FB 47ΩJ)	47Ω,±5%,1W		
R61	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R62	MF,(RS1FB 3.3kΩJ)	3.3kΩ,±5%,1/4W		
R63	CF,(ARD25T331J)	330Ω,±5%,1/4W		
R64	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R65	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R66	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R67	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R68	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R69	CF,(ARD25T823J)	82kΩ,±5%,1/4W		
R70	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R71	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R72	CF,(ARD25T223J)	22kΩ,±5%,1/4W		
R73	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R74	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R75	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R76	CF,(ARD25T104J)	100kΩ,±5%,1/4W		
R77	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R78	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R79	CF,(ARD25T103J)	10k ,±5%,1/4W		
S 1	Switch,(DIP-A(4))			
T 1	Trans,(44T75381)			
T 2	Trans,(44T75381)			
T 3	Trans,(44T76857)			
X 1	CSA4.00MT	4MHz		
Z 1	CSC300	30pF x 2		
Z 2	Battery,(GB150H-3X)	150mAh		

B

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram **5**)

CKT REF	DESCRIPTION	RATING		NOTE
C 1	Elect,(CE04C1C330)	33μF,±20%,16V		
C 2	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 3	Elect,(CE04C1A470)	47μF,±20%,10V		
C 4	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 5	Elect,(CE04C1A470)	47μF,±20%,10V		
C 6	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 7	Elect,(CE04C1C330)	33μF,±20%,16V		
C 8	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 9	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C10	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C11	Cer,(CC924CH1H470J)	47pF,±5%,50V		
C12	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C13	Elect,(CE04C1C330)	33μF,±20%,16V		
C14	Not assigned			
C15	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C16	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C17	Not assigned			
C18	Not assigned			
C19	Not assigned			
C20	Not assigned			
C21	Not assigned			
C22	Not assigned			
C23	Not assigned			
C24	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C25	Not assigned			
C26	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C27	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C28	Cer,(CC924CH1H101J)	100pF,±5%,50V		
C29	Cer,(RD340CK * CY50)	0.5 to 1pF,±0.25pF, 50V		Q'ty 1 to 3, *
	Cer,(CC924CK1H020C)	2pF,±0.25pF,50V		
	Cer,(CC924CJ1H030C)	3pF,±0.25pF,50V		
	Cer,(CC924CH1H * D)	4 to 10pF,±0.5pF, 50V		
C30	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C31	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C32	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C33	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C34	Not assigned			
C35	Not assigned			
C36	Cer,(RD340CK * CY50)	0.5 to 1pF,±0.25pF, 50V		Q'ty 1 to 3, *
	Cer,(CC924CK1H020C)	2pF,±0.25pF,50V		
	Cer,(CC924CJ1H030C)	3pF,±0.25pF,50V		
	Cer,(CC924CH1H * D)	4 to 10pF,±0.5pF, 50V		
C37	Cer,(CC924CH1H470J)	47pF,±5%,50V		
C38	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
C39	Not assigned			
C40	Cer,(CC924CH1H * D)	4 to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H * J)	12 to 47pF,±5%,50V		
C41	Cer,(CC924CH1H101J)	100pF,±5%,50V		
C42	Cer,(CC924CH1H101J)	100pF,±5%,50V		
C43	Cer,(CC924CH1H151J)	150pF,±5%,50V		
C44	Cer,(CC924CH1H151J)	150pF,±5%,50V		
C45	Not assigned			
C46	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C47	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C48	Not assigned			
C49	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C50	Cer,(CC924CH1H510J)	51pF,±5%,50V		
C51	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C52	Cer,(RD340CK010CY50)	1pF,±0.25pF,50V		
C53	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C54	Cer,(CC924CH1H101J)	100pF,±5%,50V		
C55	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C56	Not assigned			
C57	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C58	Cer,(CK924C1H104M)	0.1µF,±20%,50V		
C59	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C60	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C61	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C62	Not assigned			
C63	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C64	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C65	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C66	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C67	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C68	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C69	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C70	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C71	Not assigned			
C72	Not assigned			
C73	Not assigned			
C74	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C75	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C76	Not assigned			
C77	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C78	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C79	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C80	Not assigned			
C81	Not assinged			
C82	Not assigned			
C83 to C108	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
C109	Not assigned			
C110 to C120	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C121	Not assigned			
C122	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C123	Not assigned			
C124	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C125	Not assigned			
C126	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C127	Not assigned			
C128	Not assigned			
C129	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C130	Not assigned			
C131	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C132	Not assigned			
C133	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C134	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C135	Not assigned			
C136	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C137	Not assigned			
C138	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C139	Not assigned			
C140	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C141	Cer,(RPE111CH161G50)	160pF,±2%,50V		
C142	Not assigned			
C143	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C144	Cer,(RPE111CH161G50)	160pF,±2%,50V		
C145	Not assigned			
C146	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C147	Cer,(RPE111CH161G50)	160pF,±2%,50V		
C148	Not assigned			
C149	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C150	Cer,(RPE111CH161G50)	160pF,±2%,50V		
C151	Not assigned			
C152	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C153	Cer,(RPE111CH161G50)	160pF,±2%,50V		
C154	Not assigned			
C155	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C156	Cer,(RPE111CH161G50)	160pF,±2%,50V		
C157	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C158	Not assigned			
C159	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C160	Not assigned			
C161	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		

( ): Manufacturer's part number
* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
C162	Not assigned			
C163	Cer, (RD340CK * CY50)	0.5 to 1pF, ±0.25pF, 50V		Q'ty 0 to 3, *
	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
	Cer, (CC924CJ1H030C)	3pF, ±0.25pF, 50V		
	Cer, (CC924CH1H * D)	4 to 10pF, ±0.5pF, 50V		
	Cer, (CC924CH1H * J)	12 to 100pF, ±5%, 50V		
C164	Cer, (RD340CK * CY50)	0.5 to 1pF, ±0.25pF, 50V		Q'ty 0 to 3, *
	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
	Cer, (CC924CJ1H030C)	3pF, ±0.25pF, 50V		
	Cer, (CC924CH1H * D)	4 to 10pF, ±0.5pF, 50V		
	Cer, (CC924CH1H * J)	12 to 100pF, ±5%, 50V		
C165	Cer, (RD340CK * CY50)	0.5 to 1pF, ±0.25pF, 50V		Q'ty 0 to 3, *
	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
	Cer, (CC924CJ1H030C)	3pF, ±0.25pF, 50V		
	Cer, (CC924CH1H * D)	4 to 10pF, ±0.5pF, 50V		
	Cer, (CC924CH1H * J)	12 to 100pF, ±5%, 50V		
C166	Cer, (RD340CK * CY50)	0.5 to 1pF, ±0.25pF, 50V		Q'ty 0 to 3, *
	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
	Cer, (CC924CJ1H030C)	3pF, ±0.25pF, 50V		
	Cer, (CC924CH1H * D)	4 to 10pF, ±0.5pF, 50V		
	Cer, (CC924CH1H * J)	12 to 100pF, ±5%, 50V		
C167	Cer, (RD340CK * CY50)	0.5 to 1pF, ±0.25pF, 50V		Q'ty 0 to 3, *
	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
	Cer, (CC924CJ1H030C)	3pF, ±0.25pF, 50V		
	Cer, (CC924CH1H * D)	4 to 10pF, ±0.5pF, 50V		
	Cer, (CC924CH1H * J)	12 to 100pF, ±5%, 50V		
C168	Cer, (RD340CK * CY50)	0.5 to 1pF, ±0.25pF, 50V		Q'ty 0 to 3, *
	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
	Cer, (CC924CJ1H030C)	3pF, ±0.25pF, 50V		
	Cer, (CC924CH1H * D)	4 to 10pF, ±0.5pF, 50V		
	Cer, (CC924CH1H * J)	12 to 100pF, ±5%, 50V		
C169	Cer, (CC924CH1H510J)	51pF, ±5%, 50V		
C170	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
C171	Cer, (CC924CH1H510J)	51pF, ±5%, 50V		
C172	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
C173	Cer, (CC924CH1H510J)	51pF, ±5%, 50V		
C174	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
C175	Cer, (CC924CH1H510J)	51pF, ±5%, 50V		
C176	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		
C177	Cer, (CC924CH1H510J)	51pF, ±5%, 50V		
C178	Cer, (CC924CK1H020C)	2pF, ±0.25pF, 50V		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT
(422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
C179	Cer, (CC924CH1H510J)	51pF,5%,50V		
C180	Cer, (CC924CK1H020C)	2pF,±0.25pF,50V		
C181	Cer, (CC924F1H104Z)	0.1μF,+80/-20%,50V		
C182	Not assigned			
C183	Not assigned			
C184	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C185	Not assigned			
C186	Not assigned			
C187	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C188	Not assigned			
C189	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C190	Not assigned			
C191	Not assigned			
C192	Not assigned			
C193	Not assigned			
C194	Not assigned			
C195	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C196	Not assigned			
C197	Not assigned			
C198	Not assigned			
C199	Not assigned			
C200	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C201	Not assigned			
C202	Not assigned			
C203	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C204	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C205	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C206	Not assigned			
C207	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C208	Not assigned			
C209	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C210	Not assigned			
C211	Elect, (CE04C1J2R2)	2.2μF,±20%,63V		
C212	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C213	Cer, (CC924CH1H471J)	470pF,±5%,50V		
C214	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C215	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C216	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C217	Not assigned			
C218	Not assigned			
C219	Not assigned			
C220	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C221	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C222	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C223	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C224	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		
C225	Cer, (CK924F1H104Z)	0.1μF,+80/-20%,50V		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
C226	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C227	Not assigned			
C228	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C229	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C230	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C231	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C232	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C233	Not assigned			
C234	Cer,(CC924CH1H * J)	12 to 22pF,±5%,50V		Q'ty 0 or 1, *
C235	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C236	Elect,(CE04C1C330)	33μF,±20%,16V		
C237	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C238	Not assigned			
C239	Not assigned			
C240	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C241	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C242	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C243	Cer,(CC924CH1H * D)	3 to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H * J)	12 to 47pF,±5%,50V		
C244	Cer,(CC924CH1H * D)	4 to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H * J)	12 to 47pF,±5%,50V		
C245	Cer,(CC924CH1H * D)	4 to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H * J)	12 to 47pF,±5%,50V		
C246	Cer,(CC924CH1H * D)	4 to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H * J)	12 to 47pF,±5%,50V		
C247	Cer,(CC924CH1H * D)	4 to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H * J)	12 to 47pF,±5%,50V		
C248	Cer,(CC924CH1H * D)	4 to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H * J)	12 to 47pF,±5%,50V		
C249	Not assigned			
C250	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C251	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C252	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C253	Not assigned			
C254	Not assigned			
C255	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C256	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C257	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C258	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C259	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C260	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C261	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C262	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C263	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C264	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C265	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C266	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C267	Cer,(CC924CH1H*D)	4p to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H*J)	12p to 22pF,±5%,50V		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
C268	Cer,(CC924CH1H*D)	4p to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H*J)	12p to 22pF,±5%,50V		
C269	Cer,(CC924CH1H*D)	4p to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H*J)	12p to 22pF,±5%,50V		
C270	Cer,(CC924CH1H*D)	4p to 10pF,±0.5pF,50V		Q'ty 0 to 3, *
	Cer,(CC924CH1H*J)	12p to 22pF,±5%,50V		
C271	Cer,(CK924C1H103M)	0.01μF,±20%,50V		
C272	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C273	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C274	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
J 1	Receptacle,(BNC-R-NI)			
J 2	Receptacle,(BNC-R-NI)			
J 3	Receptacle,(BNC-R-NI)			
J 4	Receptacle,(BNC-R-NI)			
J 5	Receptacle,(BNC-R-NI)			
J 6	Receptacle,(BNC-R-NI)			
J 7	Receptacle,(BNC-R-NI)			
J 8	Receptacle,(BNC-R-NI)			
J 9	Receptacle,(BNC-R-NI)			
J10	Jack,(J12-2)			
J11	Jack,(J12-2)			
J12	Jack,(J12-2)			
J13	Jack,(J12-2)			
J14	Jack,(J12-2)			
J15	Jack,(J12-2)			
J16	Connector,(HIF23A-40D-AA30S)			
J17	Connector,(U-SB1501)			
J18	Not assigned			
J19	Connector,(DF1-15P-2.5DSA)			
J20	Not assigned			
J21 to J27	Connector,(DIC-149-3P)			
J28 to J34	Not assigned			
J35	Connector,(DIC-149-3P)			
J36 to J43	Connector,(DIC-128)			
J44 to J50	Not assigned			
J51	Connector,(DIC-149-3P)			
J52	Connector,(DIC-128)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
K 1	Relay,(PG1A-05)			
K 2	Relay,(PG1A-05)			
K 3 to K14	Relay,(PRB-4)			
K15	Relay,(PG1A-05)			
K16	Relay,(PG1A-05)			
K17	Relay,(PG1A-05)			
K18	Relay,(PG1A-05)			
K19	Relay,(PG1A-05)			
K20	Relay,(PG1A-05)			
K21	Relay,(PG1C-05)			
L 1	Coil,(10K17-75T)	0.282μH		
L 2	Coil,(LF8-560K)	56μH		
L 3	Coil,(LF8-121K)	120μH		
L 4	Coil,(LF8-121K)	120μH		
L 5	Coil,(LF8-560K)	56μH		
L 6	Coil,(LF8-121K)	120μH		
L 7	Coil,(LF8-121K)	120μH		
L 8	Coil,(SP0408-1R5K)	1.5μH		
L 9	Coil,(10K17-85T)	0.358μH		
L10	Coil,(439T23535)	0.89μH		
L11	Coil,(439T23535)	0.89μH		
L12	Coil,(439T23535)	0.89μH		
L13	Coil,(439T23535)	0.89μH		
L14	Coil,(439T23535)	0.89μH		
L15	Coil,(439T23535)	0.89μH		
L16	Coil,(442T77577)	0.3μH		
L17	Coil,(442T77577)	0.3μH		
L18	Coil,(442T77577)	0.3μH		
L19	Coil,(442T77577)	0.3μH		
L20	Coil,(442T77577)	0.3μH		
L21	Coil,(442T77577)	0.3μH		
Q 1	IC,(HD10125)			
Q 2	IC,(74S04)			
Q 3	IC,(74S64)			
Q 4	IC,(74S00)			
Q 5	IC,(74S74)			
Q 6	IC,(74S74)			
Q 7	IC,(74S00)			
Q 8	IC,(74S10)			
Q 9	IC,(74S04)			
Q10	IC,(74F374)			
Q11	IC,(74F374)			
Q12	IC,(74S02)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
Q13	IC,(74F86)			
Q14	IC,(74F86)			
Q15	IC,(74F86)			
Q16	IC,(74S64)			
Q17	IC,(74LS04)			
Q18	IC,(74F161)			
Q19	IC,(74F74)			
Q20	IC,(74F08)			
Q21	IC,(74F08)			
Q22	IC,(74F374)			
Q23	IC,(74S112)			
Q24	IC,(74S112)			
Q25	IC,(74S112)			
Q26	IC,(74S174)			
Q27	IC,(74S08)			
Q28	IC,(74LS161)			
Q29	IC,(74LS132)			
Q30	IC,(74LS74)			
Q31	IC,(74LS00)			
Q32	IC,(74LS08)			
Q33	IC,(74LS04)			
Q34	IC,(74LS08)			
Q35	IC,(74LS74A)			
Q36	IC,(74LS54)			
Q37	IC,(74LS00)			
Q38	IC,(74F190)			
Q39	IC,(74LS08)			
Q40	IC,(74S02)			
Q41	IC,(74S02)			
Q42	IC,(74S02)			
Q43	IC,(74F86)			
Q44	IC,(74F86)			
Q45	IC,(74S10)			
Q46	IC,(74LS38)			
Q47	IC,(74S10)			
Q48	IC,(74F175)			
Q49	IC,(74S74)			
Q50	IC,(74S112)			
Q51	IC,(74S74)			
Q52	IC,(74S00)			
Q53	IC,(74S04)			
Q54	IC,(74S04)			
Q55	IC,(HD10124)			
Q56	Not assigned			
Q57	IC,(74S374)			
Q58	IC,(74S374)			
Q59	IC,(74S374)			
Q60	IC,(74S374)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
Q61	IC,(HD10124)			
Q62	IC,(HD10124)			
Q63	IC,(HD10124)			
Q64	IC,(HD10124)			
Q65	IC,(HD10101)			
Q66	IC,(HD10101)			
Q67	IC,(HD10101)			
Q68	IC,(TD62003P)			
Q69	IC,(HD10124)			
Q70	IC,(HD10124)			
Q71	Not assigned			
Q72	IC,(MC10176)			
Q73	IC,(74F161)			
Q74	IC,(74F74)			
Q75	IC,(74LS74)			
Q76	IC,(74F74)			
Q77	IC,(74LS74A)			
Q78	IC,(74LS86)			
Q79	IC,(74LS191)			
Q80	IC,(74LS191)			
Q81	IC,(74LS191)			
Q82	IC,(HA17012PC)			
Q83	IC,(74LS123)			
Q84	IC,(μPC151C)			
Q85	IC,(μPC271C)			
Q86	IC,(74LS20)			
Q87	IC,(TC40H000P)			
Q88	IC,(74LS08)			
Q89	IC,(74S00)			
Q90	IC,(HA3-2525-5)			
Q91	IC,(HA3-2525-5)			
Q92	IC,(HA3-2525-5)			
Q93	IC,(MC1648)			
Q94	IC,(μPC16305)			
Q95	IC,(74LS00)			
Q96	IC,(MC10H016)			
Q97	IC,(MC10H102)			
Q98	IC,(MC12040L)			
Q99	IC,(HD10124)			
Q100	IC,(74LS161A)			
Q101	Tr,(2SC1907)			
Q102	Tr,(2SC1907)			
Q103	Tr,(2SC1907)			
Q104	Tr,(2SC1907)			
Q105	Tr,(2SC2718)			
Q106	Tr,(2SC1907)			
Q107	Tr,(2SC1907)			
Q108	Di,varicap,(FC52M)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
Q109	Di,varicap,(FC52M)			
Q110	Di,breakdown,(1SZ52)	5.9 to 6.5V,250mW		
Q111	Di,(1S953)			
Q112	Di,breakdown,(RD2.0E)	1.88 to 2.24V,400mW		
Q113	Di,(1S953)			
Q114	Di,breakdown,(RD6.2E)	5.78 to 6.44V,400mW		
Q115	Not assigned			
Q116	Di,(1S953)			
Q117	IC,(74LS02)			
Q118	IC,(TD62003P)			
Q119 to Q142	Tr,(2SC1907)			
Q143 to Q166	Di,breakdown,(RD3.6E)	3.4 to 3.845V,400mW		
Q167 to Q190	Tr,(2SC1907)			
Q191 to Q204	Di,breakdown,(RD2.7E)	2.5 to 2.93V,400mW		
Q205	Tr,(2SC2498)			
Q206	Tr,(2SC2498)			
Q207	Tr,(2SA1161)			
Q208	Tr,(2SC2498)			
Q209	Tr,(2SC2498)			
Q210	Tr,(2SA1161)			
Q211	Tr,(2SC2498)			
Q212	Tr,(2SC2498)			
Q213	Tr,(2SA1161)			
Q214	Tr,(2SC2498)			
Q215	Tr,(2SC2498)			
Q216	Tr,(2SA1161)			
Q217	Tr,(2SC2498)			
Q218	Tr,(2SC2498)			
Q219	Tr,(2SA1161)			
Q220	Tr,(2SC2498)			
Q221	Tr,(2SC2498)			
Q222	Tr,(2SA1161)			
Q223	Tr,(2SC2498)			
Q224	Tr,(2SC2498)			
Q225	Tr,(2SA1161)			
Q226	Not assigned			
Q227	Not assigned			
Q228	Not assigned			
Q229	Not assigned			
Q230	Not assigned			
Q231	Not assigned			

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
Q232	Not assigned			
Q233	Not assigned			
Q234	Not assigned			
Q235	Tr,(2SC1907)			
Q236	Tr,(2SC1907)			
Q237	Tr,(2SA1154)			
Q238	IC,(74LS74A)			
Q239	IC,(HD10101)			
Q240	IC,(74LS74A)			
Q241	IC,(74F74PC)			
Q242	IC,(74S04)			
Q243	IC,(74S04)			
Q244	Tr,(2SA1154)			
Q245	Tr,(2SC2498)			
R 1	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R 2	CF,(ARD25T562J)	5.6kΩ,±5%,1/4W		
R 3	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 4	CF,(ARD25T561J)	560Ω,±5%,1/4W		
R 5	CF,(ARD25T561J)	560Ω,±5%,1/4W		
R 6	CF,(ARD25T271J)	270Ω,±5%,1/4W		
R 7	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R 8	Not assigned			
R 9	Not assigned			
R10	CF,(ARD25T123J)	12kΩ,±5%,1/4W		
R11	Single in-line array, (IHR-4-332JA)	3.3kΩ x 4,1/8W		
R12	CF,(ARD25T473J)	47kΩ,±5%,1/4W		
R13	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R14	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R15	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R16	CF,(ARD25T272J)	2.7kΩ,±5%,1/4W		
R17	CF,(ARD25T272J)	2.7kΩ,±5%,1/4W		
R18	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R19	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R20	Not assigned			
R21	CF,(ARD25T330J)	33Ω,±5%,1/4W		
R22	Not assigned			
R23	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R24	Not assigned			
R25	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R26	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R27	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R28	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R29	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R30	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R31	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R32	CF,(ARD25T122J)	1.2kΩ,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
R33	CF, (ARD25T102J)	1kΩ, ±5%, 1/4W		
R34	Not assigned			
R35	CF, (ARD25T102J)	1kΩ, ±5%, 1/4W		
R36	Not assigned			
R37	CF, (ARD25T471J)	470Ω, ±5%, 1/4W		
R38	CF, (ARD25T102J)	1kΩ, ±5%, 1/4W		
R39	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R40	Not assigned			
R41	CF, (ARD25T511J)	510Ω, ±5%, 1/4W		
R42	CF, (ARD25T681J)	680Ω, ±5%, 1/4W		
R43	CF, (ARD25T471J)	470Ω, ±5%, 1/4W		
R44	CF, (ARD25T222J)	2.2kΩ, ±5%, 1/4W		
R45	CF, (ARD25T471J)	470Ω, ±5%, 1/4W		
R46	CF, (ARD25T101J)	100Ω, ±5%, 1/4W		
R47	CF, (ARD25T332J)	3.3kΩ, ±5%, 1/4W		
R48	Not assigned			
R49	Not assigned			
R50	Single in-line array, (IHR-8-681JA)	680Ω x 8, 1/8W		
R51	Var, MF, (RJ-6P 2kΩ)	2kΩ, 1/2W		
R52	CF, (ARD25T332J)	3.3kΩ, ±5%, 1/4W		
R53	Not assigned			
R54	CF, (ARD25T472J)	4.7kΩ, ±5%, 1/4W		
R55	CF, (ARD25T103J)	10kΩ, ±5%, 1/4W		
R56	CF, (ARD25T * J)	1k to 100kΩ, ±5%, 1/4W		} Q'ty 1 to 3, *
R57	CF, (ARD25T473J)	47kΩ, ±5%, 1/4W		
R58	CF, (ARD25T473J)	47kΩ, ±5%, 1/4W		
R59	CF, (ARD25T681J)	680Ω, ±5%, 1/4W		
R60	Var, MF, (RJ-6P 20kΩ)	20kΩ, 1/2W		
R61	MF, (RN14K2E4320D)	432Ω, ±0.5%, 1/4W		
R62	MF, (RN14K2E1500D)	150Ω, ±0.5%, 1/4W		
R63	CF, (ARD25T102J)	1kΩ, ±5%, 1/4W		
R64	CF, (ARD25T103J)	10kΩ, ±5%, 1/4W		
R65	CF, (ARD25T223J)	22kΩ, ±5%, 1/4W		
R66	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R67	CF, (ARD25T472J)	4.7kΩ, ±5%, 1/4W		
R68	CF, (ARD25T102J)	1kΩ, ±5%, 1/4W		
R69	Var, MF, (RJ-6P 5kΩ)	5kΩ, 1/2W		
R70	Not assigned			
R71	CF, (ARD25T221J)	220Ω, ±5%, 1/4W		
R72	CF, (ARD25T681J)	680Ω, ±5%, 1/4W		
R73	CF, (ARD25T221J)	220Ω, ±5%, 1/4W		
R74	CF, (ARD25T681J)	680Ω, ±5%, 1/4W		
R75	CF, (ARD25T221J)	220Ω, ±5%, 1/4W		
R76	CF, (ARD25T681J)	680Ω, ±5%, 1/4W		
R77	CF, (ARD25T221J)	220Ω, ±5%, 1/4W		
R78	CF, (ARD25T681J)	680Ω, ±5%, 1/4W		

( ) : Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
R 79	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 80	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 81	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 82	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 83	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 84	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 85	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 86	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 87	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 88	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 89	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 90	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 91	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 92	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 93	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 94	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 95	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 96	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 97	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R 98	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 99	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R100	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R101	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R102	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R103	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R104	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R105	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R106	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R107	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R108	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R109	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R110	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R111	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R112	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R113	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R114	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R115	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R116	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R117	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R118	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R119 to R130	Var,MF,(RJ-6P 100Ω)	100Ω,1/2W		
R131	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R132	CF,(ARD25T * J)	100Ω to 2.2kΩ,5%,1/4W		*
R133	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R134	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R135	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
R136	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R137	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R138	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R139	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R140	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R141	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R142	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R143	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R144	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R145	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R146	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R147	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R148	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R149	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R150	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R151	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R152	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R153	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R154	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R155	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R156	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R157	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R158	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R159	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R160	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R161	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R162	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R163	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R164	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R165	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R166	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R167	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R168	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R169	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R170	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R171	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R172	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R173	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R174	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R175	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R176	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R177	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R178	CF,(ARD25T301J)	300Ω,±5%,1/4W		
R179	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R180	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R181	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R182	CF,(ARD25T * J)	100Ω to 2.2kΩ,±5%,1/4W		*
R183	CF,(ARD25T301J)	300Ω,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram **5**)

CKT REF	DESCRIPTION	RATING		NOTE
R184	CF, (ARD25T * J)	100Ω to 2.2kΩ, ±5%, 1/4W		*
R185	CF, (ARD25T152J)	1.5kΩ, ±5%, 1/4W		
R186	CF, (ARD25T152J)	1.5kΩ, ±5%, 1/4W		
R187	CF, (ARD25T * J)	100Ω to 2.2kΩ, ±5%, 1/4W		*
R188	CF, (ARD25T301J)	300Ω, ±5%, 1/4W		
R189	CF, (ARD25T * J)	100Ω to 2.2kΩ, ±5%, 1/4W		*
R190	CF, (ARD25T152J)	1.5kΩ, ±5%, 1/4W		
R191	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R192	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R193	MF, (RN14K2E1740D)	174Ω, ±0.5%, 1/4W		
R194	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R195	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R196	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R197	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R198	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R199	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R200	MF, (RN14K2E1740D)	174Ω, ±0.5%, 1/4W		
R201	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R202	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R203	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R204	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R205	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R206	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R207	MF, (RN14K2E1740D)	174Ω, ±0.5%, 1/4W		
R208	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R209	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R210	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R211	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R212	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R213	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R214	MF, (RN14K2E1740D)	174Ω, ±0.5%, 1/4W		
R215	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R216	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R217	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R218	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R219	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R220	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R221	MF, (RN14K2E1740D)	174Ω, ±0.5%, 1/4W		
R222	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R223	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R224	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R225	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		
R226	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R227	MF, (RN14K2E1130D)	113Ω, ±0.5%, 1/4W		
R228	MF, (RN14K2E1740D)	174Ω, ±0.5%, 1/4W		
R229	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R230	MF, (RN14K2E2740D)	274Ω, ±0.5%, 1/4W		
R231	CF, (ARD25T750J)	75Ω, ±5%, 1/4W		

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( ) : Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
R232	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R233 to R244	MF,(RN14K2E82R5D)	82.5Ω,±0.5%,1/4W		
R245	CF,(ARD25T6R8J)	6.8Ω,±5%,1/4W		
R246	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R247	CF,(ARD25T6R8J)	6.8Ω,±5%,1/4W		
R248	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R249	CF,(ARD25T6R8J)	6.8Ω,±5%,1/4W		
R250	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R251	CF,(ARD25T6R8J)	6.8Ω,±5%,1/4W		
R252	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R253	CF,(ARD25T6R8J)	6.8Ω,±5%,1/4W		
R254	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R255	CF,(ARD25T6R8J)	6.8Ω,±5%,1/4W		
R256	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R257	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R258	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R259	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R260	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R261	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R262	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R263	MF,(RN14K2E8250D)	825Ω,±0.5%,1/4W		
R264	MF,(RN14K2E8250D)	825Ω,±0.5%,1/4W		
R265	MF,(RN14K2E8250D)	825Ω,±0.5%,1/4W		
R266	MF,(RN14K2E8250D)	825Ω,±0.5%,1/4W		
R267	MF,(RN14K2E8250D)	825Ω,±0.5%,1/4W		
R268	MF,(RN14K2E8250D)	825Ω,±0.5%,1/4W		
R269	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R270	Var,MF,(RJ-6P 100Ω)	100Ω,1/2W		
R271	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R272	Var,MF,(RJ-6P 100Ω)	100Ω,1/2W		
R273	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R274	Var,MF,(RJ-6P 100Ω)	100Ω,1/2W		
R275	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R276	Var,MF,(RJ-6P 100Ω)	100Ω,1/2W		
R277	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R278	Var,MF,(RJ-6P 100Ω)	100Ω,1/2W		
R279	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R280	Var,MF,(RJ-6P 100Ω)	100Ω,1/2W		
R281	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R282	Var,MF,(RJ-6P 100Ω)	100Ω,1/2W		
R283	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R284	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R285	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R286	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R287	Var,MF,(RJ-4W 1kΩ)	1kΩ,1/2W		
R288	MF,(RN14K2H151J)	150Ω,±5%,1/2W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
R289	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R290	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R291	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R292	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R293	Var,MF,(RJ-4W 1kΩ)	1kΩ,1/2W		
R294	MF,(RN14K2H151J)	150Ω,±5%,1/4W		
R295	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R296	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R297	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R298	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R299	Var,MF,(RJ-4W 1kΩ)	1kΩ,1/2W		
R300	MF,(RN14K2H151J)	150Ω,±5%,1/4W		
R301	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R302	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R303	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R304	CF,(ARD25T102J)	1Ω,±5%,1/4W		
R305	Var,MF,(RJ-4W 1kΩ)	1kΩ,1/2W		
R306	MF,(RN14K2H151J)	150Ω,±5%,1/2W		
R307	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R308	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R309	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R310	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R311	Var,MF,(RJ-4W 1kΩ)	1kΩ,1/2W		
R312	MF,(RN14K2H151J)	150Ω,±5%,1/2W		
R313	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R314	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R315	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R316	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R317	Var,MF,(RJ-4W 1kΩ)	1kΩ,1/2W		
R318	MF,(RN14K2H151J)	150Ω,±5%,1/2W		
R319	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R320	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R321	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R322	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R323	Var,MF,(RJ-4W 1kΩ)	1kΩ,1/2W		
R324	MF,(RN14K2H151J)	150Ω,±5%,1/2W		
R325	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R326	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R327	MF,(RN14K2H221J)	220Ω,±5%,1/2W		
R328	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R329	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R330	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R331	MF,(RN14K2H221J)	220Ω,±5%,1/2W		
R332	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R333	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R334	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R335	MF,(RN14K2H221J)	220Ω,±5%,1/2W		
R336	CF,(ARD25T101J)	100Ω,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
R337	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R338	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R339	MF,(RN14K2H221J)	220Ω,±5%,1/2W		
R340	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R341	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R342	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R343	MF,(RN14K2H221J)	220Ω,±5%,1/2W		
R344	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R345	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R346	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R347	MF,(RN14K2H221J)	220Ω,±5%,1/2W		
R348	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R349	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R350	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R351	MF,(RN14K2H221J)	220Ω,±5%,1/2W		
R352	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R353	Not assigned			
R354	Not assigned			
R355	Not assigned			
R356	Not assigned			
R357	Not assigned			
R358	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R359	Not assigned			
R360	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R361	Not assigned			
R362	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R363	Not assigned			
R364	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R365	Not assigned			
R366	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R367	Not assigned			
R368	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R369	Not assigned			
R370	Not assigned			
R371	Not assigned			
R372	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R373	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R374	Not assigned			
R375	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R376	Not assigned			
R377	Not assigned			
R378	Not assigned			
R379	Not assigned			
R380	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R381	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R382	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R383	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R384	CF,(ARD25T101J)	100Ω,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
R385	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R386	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R387	CF,(ARD25T122J)	1.2kΩ,±5%,1/4W		
R388	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R389	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R390	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R391	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R392	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R393	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R394	Not assigned			
R395	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R396	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R397	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R398	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		
R399 to R410	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R411	Var,MF,(RJ-6P 2kΩ)	2kΩ,1/2W		
R412	Var,MF,(RJ-6P 2kΩ)	2kΩ,1/2W		
R413	Not assigned			
R414	Single in-line array, (IHR-8-681JA)	680Ω x 8,1/8W		
R415	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R416	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R417	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R418	Not assigned			
R419	Not assigned			
R420	Not assigned			
R421	Not assigned			
R422	CF,(ARD25T131J)	130Ω,±5%,1/4W		
R423	CF,(ARD25T131J)	130Ω,±5%,1/4W		
R424	CF,(ARD25T820J)	82Ω,±5%,1/4W		
R425	CF,(ARD25T820J)	82Ω,±5%,1/4W		
R426	Not assigned			
R427	Not assigned			
R428	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R429	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R430	CF,(ARD25T131J)	130Ω,±5%,1/4W		
R431	CF,(ARD25T820J)	82Ω,±5%,1/4W		
R432	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R433	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R434	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R435	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R436	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R437	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R438	Var,MF,(RJ-6P 500Ω)	500Ω,1/2W		
R439	CF,(ARD25T131J)	130Ω,±5%,1/4W		
R440	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-3 COMPONENT LIST FOR PATTERN GENERATOR CIRCUIT (422U10937 P.C. BOARD), (Transmitter Z3 Circuit Diagram 5)

CKT REF	DESCRIPTION	RATING		NOTE
R441	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R442	Var,MF,(RJ-6P 5kΩ)	5kΩ,1/2W		
R443	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R444	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R445	Var,MF,(RJ-6P 5kΩ)	5kΩ,1/2W		
R446	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R447	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R448	Var,MF,(RJ-6P 5kΩ)	5kΩ,1/2W		
R449	Not assigned			
R450	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R451	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R452	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R453	CF,(ARD25T820J)	82Ω,±5%,1/4W		
R454	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R455	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R456	CF,(ARD25T271J)	270Ω,±5%,1/4W		
R457	CF,(ARD25T391J)	390Ω,±5%,1/4W		
R458	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
X 1	CRYSTAL OSCILLATOR, (44x80043)			44.736MHz

( ): Manufacturer's part number

* : Selected at factory

Table 4-4 COMPONENT LIST FOR FRONT PANEL CIRCUIT (422U10870 P.C. BOARD), (Transmitter Z4 Circuit Diagram 6)

CKT REF	DESCRIPTION	RATING		NOTE
C 1	Elect,(CE02C1V470)	47μF,±20%,35V		
C 2	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 3	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 4	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 5	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 6	Cer,(CK924F1H104Z)	0.1μF,±80/-20%,50V		
J 1	Connector, (HIF23A-26D-AA20S)			
Q 1	LED,(TLG226)			
Q 2	LED,(TLG226)			
Q 3	LED,(TLG226)			
Q 4	LED,(TLG226)			
Q 5	LED,(LN513GA)			
Q 6	LED,(LN513GA)			
Q 7	LED,(LN513GA)			
Q 8	LED,(LN342GPH)			
Q 9	LED,(LN342GPH)			
Q10	LED,(LN342GPH)			
Q11	LED,(LN342GPH)			
Q12	LED,(LN342GPH)			
Q13	LED,(LN342GPH)			
Q14	LED,(LN342GPH)			
Q15	LED,(LN342GPH)			
Q16	LED,(LN342GPH)			
Q17	LED,(TLG226)			
Q18	LED,(LN442YPH)			
Q19	Tr,(2SC2901)			
Q20	IC,(μPA79C)			
Q21	Not assigned			
Q22	IC,(74LS138)			
Q23	IC,(74LS138)			
Q24	Tr,(2SA1154)			
Q25	Tr,(2SA1154)			
Q26	Tr,(2SA1154)			
Q27	Tr,(2SA1154)			
Q28	Tr,(2SA1154)			
Q29	Tr,(2SA1154)			
Q30	Tr,(2SA1154)			
Q31	Tr,(2SA1154)			
Q32	LED,(TLG226)			
Q33	LED,(TLG226)			
Q34	LED,(TLG226)			

D

( ): Manufacturer's part number

* : Selected at factory

Table 4-4 COMPONENT LIST FOR FRONT PANEL CIRCUIT (422U10870 P.C. BOARD), (Transmitter Z4 Circuit Diagram 6)

CKT REF	DESCRIPTION	RATING		NOTE
R 1	CF,(ARD25T331J)	330Ω,±5%,1/4W		
R 2	CF,(ARD25T680J)	68Ω,±5%,1/4W		
R 3	CF,(ARD25T680J)	68Ω,±5%,1/4W		
R 4	CF,(ARD25T680J)	68Ω,±5%,1/4W		
R 5	CF,(ARD25T680J)	68Ω,±5%,1/4W		
R 6	CF,(ARD25T680J)	68Ω,±5%,1/4W		
R 7	CF,(ARD25T680J)	68Ω,±5%,1/4W		
R 8	CF,(ARD25T680J)	68Ω,±5%,1/4W		
R 9	CF,(ARD25T680J)	68Ω,±5%,1/4W		
R10	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R11	Not assigned			
R12	CF,(ARD25T331J)	330Ω,±5%,1/4W		
R13	Single in-line array, (IHR-4-103JA)	10kΩ x 4,1/8W		
R14	Single in-line array, (IHR-7-331JB)	330Ω x 7,1/8W		
R15	Single in-line array, (IHR-6-103JA)	10kΩ x 6,1/8W		
R16	CF,(RG161N20SB 10kΩM)	10kΩ,±20%,1/2W		
S 1	Switch,(HL20-LSAB)			
S 2	Switch,(HL20-NS)			
S 3	Switch,(HL20-LSAB)			
S 4	Switch,(HL20-NS)			
S 5	Switch,(HL20-LSAB)			
S 6	Switch,(HL20-LSAB)			
S 7	Switch,(HL20-LSAB)			
S 8	Switch,(HL20-LSAB)			
S 9	Switch,(HL20-LSAB)			
S10	Switch,(HL20-LSAB)			
S11	Switch,(HL20-LSAB)			
S12	Switch,(HL20-LSAB)			
S13	Switch,(HL20-LSAB)			
S14	Switch,(HL20-NS)			
S15	Switch,(HL20-NS)			
S16	Switch,(HL20-NS)			
S17	Switch,(HL20-LSAB)			
S18	Switch,(HL20-LSAB)			
S19	Switch,(HL20-LSAB)			
S20	Switch,(HL20-NS)			
S21	Switch,(HL20-LSAB)			

D

( ): Manufacturer's part number

* : Selected at factory

Table 4-5 COMPONENT LIST FOR OPTION 01 TO 04 CIRCUIT (422U78588 P.C. BOARD), (Transmitter Z5 Circuit Diagram 7)

CKT REF	DESCRIPTION	RATING		NOTE
C 1	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C 2	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 3	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C 4	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C 5	Cer,(CK924C1H104M)	0.1μF,±20%,50V		
C 6	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 7	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 8	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 9	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C10	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C11	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C12	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C13	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C14	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C15	Elect,(CE04C1A470)	47μF,±20%,10V		
C16	Elect,(CE04C1A470)	47μF,±20%,10V		
C17	Elect,(CE04C1C330)	33μF,±20%,16V		
C18	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C19	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
J 1	Connector,(U-PB1519)			
K 1	Read relay,(PG1A-05D)			
K 2	Read relay,(PG1A-05D)			
K 3	Read relay,(PG1A-05D)			
K 4	Read relay,(PG1A-05D)			
Q 1	IC,(HD10125)			
Q 2	Not assigned			
Q 3	Not assigned			
Q 4	IC,(74S64)			
Q 5	IC,(74LS38)			
R 1	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R 2	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R 3	CF,(ARD25T153J)	15kΩ,±5%,1/4W		
R 4	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R 5	CF,(ARD25T153J)	15kΩ,±5%,1/4W		
R 6	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R 7	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R 8	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R 9	CF,(ARD25T153J)	15kΩ,±5%,1/4W		
R10	CF,(ARD25T153J)	15kΩ,±5%,1/4W		

E

( ): Manufacturer's part number

* : Selected at factory

Table 4-5 COMPONENT LIST FOR OPTION 01 TO 04 CIRCUIT (442U78588 P.C. BOARD), (Transmitter Z5 Circuit Diagram 7)

CKT REF	DESCRIPTION	RATING		NOTE
R11	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R12	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R13	Var,MF,(RJ-6P 5kΩJ)	5kΩ,1/2W		
R14	Var,MF,(RJ-6P 5kΩJ)	5kΩ,1/2W		
R15	Var,MF,(RJ-6P 5kΩJ)	5kΩ,1/2W		
R16	Var,MF,(RJ-6P 5kΩJ)	5kΩ,1/2W		
R17	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
Z 1	QUARTZ CRYSTAL, (44X67371)			OPT 01 to 04
Z 2	QUARTZ CRYSTAL, (44X67371)			OPT 01 to 04
Z 3	QUARTZ CRYSTAL, (44X67371)			OPT 01 to 04
Z 4	QUARTZ CRYSTAL, (44X67371)			OPT 01 to 04

E

( ) : Manufacturer's part number

* : Selected at factory

Table 4-6 COMPONENT LIST FOR GP-IB INTERFACE CIRCUIT
(442U77923 P.C. BOARD), (Transmitter/Receiver Z6 Circuit Diagram **8**)

CKT REF	DESCRIPTION	RATING		NOTE
C 1	Elect,(CE04C1A470)	47μF,±20%,10V		
C 2	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 3	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
J 1	Connector, (57LE-20240-27CD35)			
Q 1	IC,(74LS00)			
Q 2	IC,(74LS240)			
Q 3	IC,(8291A)			
Q 4	IC,(SN75160AN)			
Q 5	IC,(SN75161AN)			
Q 6	IC,(74LS245)			
Q 7	IC,(74LS244)			
R 1	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		
R 2	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		
R 3	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		
R 4	Single in-line array, (IHR-4-103JA)	10kΩ x 4,1/8W		
S 1	Dip Switch,(BP-8)			

F

( ): Manufacturer's part number

* : Selected at factory

Table 4-7 COMPONENT LIST FOR RS-232C INTERFACE CIRCUIT (442U79127 P.C. BOARD), (Transmitter/Receiver Z7 Circuit Diagram 9)

CKT REF	DESCRIPTION	RATING		NOTE
C 1	Cer,(CC45CH1H151J)	150pF,±5%,50V		
C 2	Elect,(CE04C1A470)	47μF,±20%,10V		
C 3	Elect,(CE04C1C330)	33μF,±20%,16V		
C 4	Elect,(CE04C1C330)	33μF,±20%,16V		
C 5	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 6	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 7	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 8	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C 9	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C10	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C11	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
J 1	Connector,(DB-25SA-J4)			
J 2	Connector,(DIC-149-3P)			
J 3	Connector,(DIC-149-3P)			
J 4	Connector,(DIC-149-3P)			
J 5	Connector,(DIC-128)			
J 6	Connector,(DIC-128)			
J 7	Connector,(DIC-128)			
Q 1	Di,(1S953)			
Q 2	Di,(1S953)			
Q 3	Di,(1S953)			
Q 4	Di,(1S953)			
Q 5	IC,(74LS365A)			
Q 6	IC,(74LS365A)			
Q 7	IC,(74LS245)			
Q 8	IC,(74LS32)			
Q 9	IC,(74LS02)			
Q10	IC,(74LS244)			
Q11	IC,(COM8146)			
Q12	IC,(74LS74A)			
Q13	IC,(μPD8251AC)			
Q14	IC,(SN75150P)			
Q15	IC,(SN75150P)			
Q16	IC,(SN75154P)			
Q17	IC,(SN75154P)			
R 1	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		
R 2	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-7 COMPONENT LIST FOR RS-232C INTERFACE CIRCUIT (442U79127 P.C. BOARD), (Transmitter/Receiver Z7 Circuit Diagram 9)

CKT REF	DESCRIPTION	RATING		NOTE
R 3	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		
R 4	Single in-line array, (IHR-6-103JA)	10kΩ x 6,1/8W		
S 1	Switch,(DIP-A(8))			
S 2	Rotary,(S-2031)			
X 1	CRYSTAL OSCILLATOR, (34X73400)	5.0688MHz		

( ): Manufacturer's part number

* : Selected at factory

Table 4-8 COMPONENT LIST FOR ME462B RECEIVER UNIT (Receiver Unit Circuit Diagram 10)

CKT REF	DESCRIPTION	RATING		NOTE
G 1	Fan,(FB08B12L)			
J 1	Not assigned			
J 2	Connector,(DF1-15S-2.5R24)			
J 3	Terminal,(34E5848D)			
J 4	Terminal,(34E5848D)			
J 5	Terminal,(A-12)			
J 6	Connector,(PI-011-06F)			
J 7	Connector, (DF1-5S-2.5R24)			
J 8	Connector, (HIF3A5-34D-AA50S)			
J 9	Receptacle,(BNC-R-NI)			
J10	Receptacle,(BNC-R-NI)			
J11	Receptacle,(BNC-R-NI)			
J12	Receptacle,(BNC-R-NI)			
J13	Receptacle,(BNC-R-NI)			
J14	Receptacle,(BNC-R-NI)			
J15	Terminal,(10ϕ 349H7025D)			
J16	Terminal,(10ϕ 349H7025D)			
J17	Terminal,(10ϕ 349H7025D)			
J18	Terminal,(10ϕ 349H7025D)			
J19	Connector, (DF1-8S-2.5R24)			
J20	Connector, (HIF3A-20D-AA50S)			
J21	Receptacle,(BNC-R-NI)			
J22	Connector, (DF1-10S-2.5R24)			
J23	Connector, (DF1-10S-2.5R24)			
S 1	Pushbutton,(NE-15J(2)-2U)			
S 2	Toggle,(8E2011)			
S 3	Pushbutton,(8R1021)			

H

( ): Manufacturer's part number

* : Selected at factory

Table 4-8 COMPONENT LIST FOR ME462B RECEIVER UNIT (Receiver Unit Circuit Diagram 10)

CKT REF	DESCRIPTION	RATING		NOTE
T 1	Power trans,(44T76814)			
Z 1	Inlet			****A (See Note.)
Z 2	CONTROL CIRCUIT, (422U10851 P.C. Board)			
Z 3	ERROR DETECTOR CIRCUIT,(422U10849 P.C. Board)			
Z 4	FRONT PANEL CIRCUIT, (422U10872 P.C. Board)			
Z 5	PRINTER			OPT 11
Z 6	GP-IB INTERFACE			OPT 31
Z 7	RS-232C INTERFACE			OPT 32
Z 8	SWITCH CIRCUIT, (442U79289 P.C. Board)			

H

( ): Manufacturer's part number

* : Selected at factory

Table 4-9 COMPONENT LIST FOR CONTROL CIRCUIT (422U10851 P.C. BOARD), (Receiver Z2 Circuit Diagram 11)

CKT REF	DESCRIPTION	RATING		NOTE
C 1	Not assigned			
C 2	Not assigned			
C 3	Not assigned			
C 4	Elect,(CE04C1C330)	33µF,±20%,16V		
C 5	Elect,(ECEM80R682L)	6800µF,±15%,80V		
C 6	Elect,(CE04C1J4R7)	4.7µF,±20%,63V		
C 7	Elect,(CE04C1A470)	47µF,±20%,10V		
C 8	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C 9	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C10	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C11	Elect,(ECEA1HG221S)	220µF,+50/-20%,50V		
C12	Elect,(ECEA1CG222S)	2200µF,+50/-20%,16V		
C13	Elect,(ECEA1CG102S)	1000µF,+50/-20%,16V		
C14	Elect,(ECEA10T102S)	1000µF,+50/-20%,10V		
C15	Elect,(ECEA2AG221S)	220µF,+50/-20%,100V		
C16	Elect,(ECEA1HG471S)	470µF,+50/-20%,50V		
C17	Elect,(CE04C1J101)	100µF,±20%,63V		
C18	Elect,(CE04C1J101)	100µF,±20%,63V		
C19	Elect,(ECET35R472SW)	4700µF,+50/-20%,35V		
C20	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C21	Elect,(CE04C1J4R7)	4.7µF,±20%,63V		
C22	Cer,(CK924C1H * M)	0.001 to 0.01µF, ±20%,50V		Q'ty 0 to 2, *
C23	Cer,(CK924C1H * M)	0.001 to 0.1µF, ±20%,50V		Q'ty 0 to 2, *
C24	Elect,(CE04C1J2R2)	2.2µF,±20%,63V		
C25	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		Q'ty 0 to 3
C26	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C27	Cer,(CK924C1H * M)	100pF to 0.01µF, ±20%,50V		Q'ty 0 to 2, *
C28	Plast,(ECQ-M1H104KZ)	0.1µF,±10%,50V		
C29	Not assigned			
C30	Elect,(CE04C1J2R2)	2.2µF,±20%,63V		
C31	Elect,(CE04C1J2R2)	2.2µF,±20%,63V		
C32	Not assigned			
C33	Not assigned			
C34	Not assigned			
C35	Cer,(CC924CH1H221J)	220pF,±5%,50V		
C36	Cer,(CK924C1H103M)	0.01µF,±20%,50V		
C37	Plast,(ECQ-P1 104FZ)	0.1µF,±1%,100V		
C38	Plast,(ECQ-M1H104KZ)	0.1µF,±10%,50V		
C39	Plast,(ECQ-M1H104KZ)	0.1µF,±10%,50V		
C40	Plast,(ECQ-M1H223KZ)	0.022µF,±10%,50V		
C41	Cer,(CC924CH1H820J)	82pF,±5%,50V		
C42	Var,cer,(TZ03R300A)	30pF,100V		

( ): Manufacturer's part number

* : Selected at factory

Table 4-9 COMPONENT LIST FOR CONTROL CIRCUIT
(422U10851 P.C. BOARD), (Receiver Z2 Circuit Diagram 11)

CKT REF	DESCRIPTION	RATING		NOTE
C43	Elect,(CE04C1J2R2)	2.2μF,±20%,63V		
C44	Elect,(CE04C1J4R7)	4.7μF,±20%,63V		
C45	Elect,(CE04C1A470)	47μF,±20%,10V		
C46	Elect,(CE04C1C330)	33μF,±20%,16V		
C47	Elect,(CE04C1C330)	33μF,±20%,16V		
C48	Elect,(CE04C1A470)	47μF,±20%,10V		
C49	Elect,(CE04C1V470)	47μF,±20%,35V		
C50	Elect,(CE04C1A470)	47μF,±20%,10V		
C51 to C73	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
F 1	Fuse,(MF51NN250V5ADC01)	5A,250V		
F 2	Fuse,(MF51NN250V5ADC01)	5A,250V		
F 3	Fuse,(MF51NN250V5ADC01)	1A,250V		
F 4	Fuse,(MF51NN250V1ADC01)	1A,250V		
F 5	Fuse,(MF51NN250V5ADC01)	5A,250V		
F 6	Fuse,(SF-96U)	96°C,10A,250V		
J 1	Connector, (DF1-15P-2.5DSA)			
J 2	Connector, (HIF3-40P-2.54DSA)			
J 3	Connector, (HIF3-40P-2.54DSA)			
J 4	Connector, (HIF3-34P-2.54DSA)			
J 5	Connector, (HIF3-20P-2.54DSA)			
J 6	Connector, (DF1-8P-2.5DSA)			
K 1	Relay,(G2L-113P-V(12V))			
K 2	Relay,(G2R-117P-V(12V))			
K 3	Relay,(PG1C-05D)			
L 1	Coil,(SKL-202A)	50μH		
L 2	Coil,(SC-10-100)	1mH		
L 3	Coil,(HP-024)	950μH		
L 4	Coil,(HP-023)	300μH		
L 5	Coil,(LH1-471K)	470μH		
M 1	Timer,(TM-0)			

J

( ): Manufacturer's part number
* : Selected at factory

Table 4-9 COMPONENT LIST FOR CONTROL CIRCUIT
(422U10851 P.C. BOARD), (Receiver Z2 Circuit Diagram **11**)

CKT REF	DESCRIPTION	RATING		NOTE
Q 1	IC,(µPC451C)			
Q 2	Di,breakdown,(02BZ2.2)	1.88 to 2.56V,250mW		
Q 3	Rectifier,(D5FB20)			
Q 4	Rectifier,(RB-152-LFB)			
Q 5	IC,(µPC14324H)			
Q 6	IC,(µPC16312H)			
Q 7	Di,breakdown,(RD5.1E)	4.8 to 5.37V,400mW		
Q 8	Di,breakdown,(RD5.1E)	4.8 to 5.37V,400mW		
Q 9	Photo coupler,(PC614)			
Q10	Di,(S10SC4M)			
Q11	Di,breakdown,(RD13E)	12.11 to 13.66V, 400mW		
Q12	Tr,(2SC1008)			
Q13	Di,(V03G)			
Q14	Photo coupler,(PC618)			
Q15	Tr,(2SC2718)			
Q16	Not assigned			
Q17	Di,(1S955)			
Q18	Di,(1S955)			
Q19	Tr,(2SA780A)			
Q20	Tr,(2SA780A)			
Q21	IC,(µPC1042C)			
Q22	Di,(1S953)			
Q23	Di,(1S953)			
Q24	Di,(1S955)			
Q25	Di,(1S955)			
Q26	Di,(V03G)			
Q27	Di,(1S955)			
Q28	Di,(1S955)			
Q29	Di,(V03G)			
Q30	Tr,(2SC3164)			
Q31	Tr,(2SC3164)			
Q32	Di,(S5KC20H)			
Q33	Not assigned			
Q34	Di,(S5KC20HR)			
Q35	Di,(S5KC20H)			
Q36	Di,(1S1300)			
Q37	Not assigned			
Q38	Di,breakdown,(RD13E)	12.11 to 13.66V,400mW		
Q39	Tr,(2SC1826S)			
Q40	Di,1S953)			
Q41	Di,(1SS99)			
Q42	Di,breakdown,(RD13E)	12.11 to 13.66V,400mW		
Q43	Tr,(2SC1826S)			
Q44	Di,(1S953)			
Q45	Di,(1S953)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-9 COMPONENT LIST FOR CONTROL CIRCUIT (422U10851 P.C. BOARD), (Receiver Z2 Circuit Diagram 11)

CKT REF	DESCRIPTION	RATING		NOTE
Q46	Di,(1SS99)			
Q47	Di,(1SS99)			
Q48	Not assigned			
Q49	Not assigned			
Q50	IC,(μPD8279C-2)			
Q51	IC,(μPD8253C-2)			
Q52	IC,(μPD8253C-2)			
Q53	IC,(μPD8253C-2)			
Q54	IC,(74LS74A)			
Q55	IC,(74LS08)			
Q56	IC,(μ74LS04)			
Q57	IC,(74LS390)			
Q58	IC,(74LS04)			
Q59	IC,(74LS245)			
Q60	IC,(74LS245)			
Q61	IC,(74LS32)			
Q62	IC,(74LS32)			
Q63	IC,(74LS157)			
Q64	IC,(74LS00)			
Q65	IC,(74LS04)			
Q66	IC,(74LS365A)			
Q67	IC,(μPD8259AC-2)			
Q68	IC,(7437)			
Q69	IC,(μPD780C-1)			
Q70	IC,(74LS245)			
Q71	IC,(74LS139)			
Q72	IC,(74LS123)			
Q73	IC,(74LS155)			
Q74	IC,(μPD7002C)			
Q75	IC,(μPC151C)			
Q76	IC,(μPD8279C-2)			
Q77	IC,(74LS74A)			
Q78	IC,(74LS42)			
Q79	IC,(74LS14)			
Q80	IC,(74LS04)			
Q81	IC,(μPD8255AC-2)			
Q82	IC,(74LS365A)			
Q83	IC,(74LS244)			
Q84	IC,(RP5C15)			
Q85	IC,(TC5565PL-15)			
Q86	IC,(EPROM16Kx8-25N)			
Q87	IC,(EPROM16Kx8-25N)			
Q88	IC,(TL7705CP)			
Q89	IC,(TC4093BP)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-9 COMPONENT LIST FOR CONTROL CIRCUIT
(422U10851 P.C. BOARD), (Receiver Z2 Circuit Diagram 11)

CKT REF	DESCRIPTION	RATING		NOTE
R 1	CF,(RS1FB 3.3kΩJ)	3.3kΩ,±5%,1W		
R 2	CF,(ARD25T331J)	330Ω,±5%,1/4W		
R 3	CF,(ARD25T560J)	56Ω,±5%,1/4W		
R 4	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R 5	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R 6	CF,(ARD25T * J)	4.7k to 100kΩ,±5%, 1/4W		*
R 7	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R 8	CF,(ARD25T * J)	10k to 1MΩ,±5%,1/4W		
R 9	CF,(ARD25T331J)	330Ω,±5%,1/4W		
R10	MF,(RS2FB 2.2kΩJ)	2.2kΩ,±5%,1/4W		
R11	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R12	MF,(RN14K2H682J)	6.8kΩ,±5%,1/2W		
R13	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R14	CF,(ERF-5SK-3R3)	3.3Ω,±10%,5W		
R15	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R16	MF,(RS2FB 1kΩJ)	1kΩ,±5%,2W		
R17	MF,(RS2FB 1kΩJ)	1kΩ,±5%,2W		
R18	Not assigned			
R19	Not assigned			
R20	CF,(ERF-2SK-5R1)	5.1Ω,±10%,2W		
R21	CF,(ARD25T221J)	220Ω,±5%,1/4W		Q'ty 1 to 3, *
R22	CF,(ARD25T * J)	1k to 100kΩ,±5%, 1/4W		
R23	CF,(ARD25T473J)	47kΩ,±5%,1/4W		
R24	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R25	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R26	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		Q'ty 1 to 3, *
R27	CF,(ARD25T * J)	22k to 100kΩ,±5%, 1/4W		
R28	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R29	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R30	CF,(ARD25T223J)	22kΩ,±5%,1/4W		
R31	CF,(ARD25T473J)	47kΩ,±5%,1/4W		
R32	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R33	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R34	CF,(ARD25T470J)	47Ω,±5%,1/4W		Q'ty 0 to 2, *
R35	CF,(ARD25T * J)	6.8 to 22Ω,±5%,1/4W		
R36	CF,(ARD25T * J)	10 to 100Ω,±5%,1/4W		Q'ty 1 or 2, *
R37	CF,(ARD25T470J)	47Ω,±5%,1/4W		Q'ty 0 to 2, *
R38	CF,(ARD25T * J)	6.8 to 22Ω,±5%,1/4W		
R39	CF,(ARD25T * J)	10 to 100Ω,±5%,1/4W		Q'ty 1 or 2, *
R40	Not assigned			

( ): Manufacturer's part number

* : Selected at factory

Table 4-9 COMPONENT LIST FOR CONTROL CIRCUIT (422U10851 P.C. BOARD), (Receiver Z2 Circuit Diagram 11)

CKT REF	DESCRIPTION	RATING		NOTE
R41	Not assigned			
R42	Not assigned			
R43	Not assigned			
R44	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R45	MF,(RN14K2H332J)	3.3kΩ,±5%,1/2W		
R46	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R47	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R48	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R49	CF,(ARD25T105J)	1MΩ,±5%,1/4W		
R50	CF,(ARD25T121J)	120Ω,±5%,1/4W		
R51	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R52	CF,(ARD25T104J)	100kΩ,±5%,1/4W		
R53	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R54	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R55	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R56	CF,(ARD25T100J)	10Ω,±5%,1/4W		
R57	Single in-line array, (IHR-8-104JA)	100kΩ x 8,1/8W		
R58	Single in-line array, (IHR-6-103JA)	10kΩ x 6,1/8W		
R59	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R60	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R61	CF,(ARD25T104J)	100kΩ,±5%,1/4W		
R62	CF,(ARD25T104J)	100kΩ,±5%,1/4W		
R63	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R64	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R65	CF,(ARD25T122J)	1.2kΩ,±5%,1/4W		
R66	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R67	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R68	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R69	Not assigned			
R70	Single in-line array, (IHR-6-103JA)	10kΩ x 6,1/8W		
R71	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R72	Single in-line array, (IHR-6-103JA)	10kΩ x 6,1/8W		
R73	Single in-line array, (IHR-6-103JA)	10kΩ x 6,1/8W		
S 1	Switch,(DIP-A(4))			
T 1	Trans,(44T75381)			
T 2	Trans,(44T75381)			
T 3	Trans,(44T76820)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-9 COMPONENT LIST FOR CONTROL CIRCUIT (422U10851 P.C. BOARD), (Receiver Z2 Circuit Diagram 11)

CKT REF	DESCRIPTION	RATING		NOTE
X 1	Crystal Oscillator, (MX-38)	32.768KHz		
Z 1	QUARTZ CRYSTAL,(TD308A)	6MHz		
Z 2	BATTERY,(GB150H-3X)	3.6V		

J

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
C 1 to C27	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C28	Elect,(CE04C1C330)	33µF,±20%,16V		
C29 to C46	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C47	Elect,(CE04C1C330)	33µF,±20%,16V		
C48	Cer,(CC924CH1H471J)	470pF,±5%,50V		
C49	Cer,(CC924CH1H510J)	51pF,±5%,50V		
C50	Var,Cer,(TZ03T110A)	11pF,100V		
C51	Cer,(RD340CK010CY50)	1pF,±0.25pF,50V		
C52 to C67	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C68	Plast,(ECQ-M1H102KZ)	1000pF,±10%,50V		
C69	Elect,(CE04C1J2R2)	2.2µF,±20%,63V		
C70	Elect,(CE04C1J4R7)	4.7µF,±20%,63V		
C71	Plast,(ECQ-M1H102KZ)	1000pF,±10%,50V		
C72	Elect,(CE04C1J4R7)	4.7µF,±20%,63V		
C73	Elect,(CE04C1J2R2)	2.2µF,±20%,63V		
C74	Plast,(ECQ-M1H103KZ)	0.01µF,±10%,50V		
C75	Cer,(CC924CH1H101J)	100pF,±5%,50V		
C76	Plast,(ECQ-M1H103KZ)	0.01µF,±10%,50V		
C77	Cer,(CC924CH1H471J)	470pF,±5%,50V		
C78	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C79	Cer,(CC924CH1H471J)	470pF,±5%,50V		
C80	Cer,(CC924CH1H471J)	470pF,±5%,50V		
C81	Elect,(CE04C1J2R2)	2.2µF,±20%,63V		
C82	Elect,(CE04C1A101)	100µF,±20%,10V		
C83	Elect,(CE04C1C470)	47µF,±20%,16V		
C84	Plast,(ECQ-M1H102KZ)	1000pF,±10%,50V		
C85	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C86	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C87	Cer,(CC924CH1H471J)	470pF,±5%,50V		
C88 to C142	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C143	Cer,(CC924CH1H471J)	470pF,±5%,50V		
C144	Cer,(CC924CH1H471J)	470pF,±5%,50V		
C145	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C146	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C147	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C148	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C149	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C150	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		
C151	Cer,(CK924F1H104Z)	0.1µF,+80/-20%,50V		

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
C152	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
C153	Elect,(CE04C1C330)	33μF,±20%,16V		
C154	Elect,(CE04C1C330)	33μF,±20%,16V		
C155	Elect,(CE04C1A470)	47μF,±20%,10V		
C156	Cer,(CK924F1H104Z)	0.1μF,+80/-20%,50V		
J 1	Connector,(J12-2)			
J 2	Receptacle,(BNC-R-NI)			
J 3	Receptacle,(BNC-R-NI)			
J 4	Connector,(PI011-06M)			
J 5	Plug,(DF1-5P-2.5DSA)			
J 6	Connector, (HIF23A-40D-AA20S)			
J 7	Terminal,(DIC-149-3P)			
J 8	Terminal,(DIC-149-3P)			
J 9	Terminal,(DIC-149-3P)			
J 10	Terminal,(DIC-149-3P)			
J 11	Terminal,(DIC-149-3P)			
J 12	Connector,(DIC-128)			
J 13	Connector,(DIC-128)			
J 14	Connector,(DIC-128)			
J 15	Connector,(DIC-128)			
J 16	Connector,(DIC-128)			
J 17	Plug,(DF1-10P-2.5DSA)			
K 1	Relay,(PG1C-05)			
K 2	Relay,(PG1C-05)			
K 3	Relay,(PG1C-05)			
K 4	Relay,(PG1C-05)			
K 5	Buzzer,(CMB-06)			
L 1	Coil,(34L55686G)	0.358μH		
Q 1	Tr,(2SC1907)			
Q 2	Tr,(2SC1907)			
Q 3	Tr,(2SC1907)			
Q 4	Tr,(2SC1907)			
Q 5	Tr,(2SC1907)			
Q 6	Tr,(2SC1907)			
Q 7	Tr,(2SC1907)			
Q 8	Tr,(2SC1907)			
Q 9	Tr,(2SC2498)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram **12**)

CKT REF	DESCRIPTION	RATING		NOTE
Q10	Tr,(2SC1907)			
Q11	Di,(FC-51M)			
Q12	Di,(FC-51M)			
Q13	Di,(FC-51M)			
Q14	Di,(1SS99)			
Q15	Di,(1SS99)			
Q16	IC,(μPC251C)			
Q17	Di,(1S953)			
Q18	Not assigned			
Q19	Not assigned			
Q20	Not assigned			
Q21	Not assigned			
Q22	Not assigned			
Q23	Not assigned			
Q24	Not assigned			
Q25	Tr,(2SC1907)			
Q26	Tr,(2SC2498)			
Q27	Tr,(2SC1907)			
Q28	Tr,(2SC2498)			
Q29	Tr,(2SC1907)			
Q30	Tr,(2SC2498)			
Q31	Tr,(2SC2498)			
Q32	Tr,(2SC2498)			
Q33	Tr,(2SC2498)			
Q34	Tr,(2SC1907)			
Q35	Tr,(2SC1907)			
Q36	Tr,(2SC1907)			
Q37	Tr,(2SC2498)			
Q38	Tr,(2SC2498)			
Q39	FET,(3SK-59BL)			
Q40	Di,(1S953)			
Q41	Di,(1S953)			
Q42	Di,(1S953)			
Q43	Di,(1SS99)			
Q44	Di,(1SS99)			
Q45	Di,(1S953)			
Q46	Di,(1S953)			
Q47	Di,(1S953)			
Q48	Di,breakdown,(RD5.1E)	4.8 to 5.37V,400mW		
Q49	Di,(1S953)			
Q50	Not assigned			
Q51	Di,breakdown,(RD5.1E)	4.8 to 5.37V,400mW		
Q52	Tr,(2SC1907)			
Q53	Tr,(2SC1907)			
Q54	Di,breakdown,(RD5.1E)	4.8 to 5.37V,400mW		
Q55	Di,breakdown,(RD5.1E)	4.8 to 5.37V,400mW		

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( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
Q56	Tr,(2SC2498)			
Q57	Tr,(2SC2498)			
Q58	Tr,(2SC2498)			
Q59	Tr,(2SC2498)			
Q60	Tr,(2SC1907)			
Q61	Tr,(2SC1907)			
Q62	Tr,(2SC1907)			
Q63	Tr,(2SC1907)			
Q64	Tr,(2SC1907)			
Q65	Not assigned			
Q66	Di,(1S953)			
Q67	Di,(1S953)			
Q68	Di,(1S953)			
Q69	Di,(1S953)			
Q70	Not assigned)			
Q71	IC,(74LS123)			
Q72	IC,(74LS00)			
Q73	IC,(74S00)			
Q74	IC,(74LS123)			
Q75	IC,(74LS38)			
Q76	IC,(74S04)			
Q77	IC,(74LS393)			
Q78	IC,(74LS393)			
Q79	IC,(74LS175)			
Q80	IC,(74LS10)			
Q81	IC,(74LS112A)			
Q82	IC,(74LS175)			
Q83	IC,(74F161APC)			
Q84	IC,(74LS123)			
Q85	IC,(74LS123)			
Q86	IC,(74LS00)			
Q87	IC,(74LS04)			
Q88	IC,(74S64)			
Q89	IC,(74S00)			
Q90	IC,(74LS138)			
Q91	IC,(74LS138)			
Q92	IC,(74LS374)			
Q93	IC,(74LS374)			
Q94	IC,(74LS175)			
Q95	IC,(74LS112A)			
Q96	IC,(74LS08)			
Q97	IC,(74LS163A)			
Q98	IC,(74S20)			
Q99	IC,(74F374PC)			
Q100	IC,(74F86PC)			
Q101	IC,(74LS123)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
Q102	IC,(74LS74A)			
Q103	IC,(74S74)			
Q104	IC,(74LS74A)			
Q105	IC,(74LS14)			
Q106	IC,(74LS240)			
Q107	IC,(74LS374)			
Q108	IC,(74LS374)			
Q109	IC,(74LS240)			
Q110	IC,(74LS20)			
Q111	IC,(74LS74A)			
Q112	IC,(74LS86)			
Q113	IC,(74S112)			
Q114	IC,(74F374PC)			
Q115	IC,(74F161APC)			
Q116	IC,(74S74)			
Q117	IC,(74S00)			
Q118	IC,(74F191PC)			
Q119	IC,(74S02)			
Q120	IC,(74S00)			
Q121	IC,(74S02)			
Q122	IC,(74F175PC)			
Q123	IC,(74F191PC)			
Q124	IC,(74S74)			
Q125	IC,(74LS11)			
Q126	IC,(74LS74A)			
Q127	IC,(74LS00)			
Q128	IC,(74S51)			
Q129	IC,(74S74)			
Q130	IC,(74LS390)			
Q131	IC,(74F175PC)			
Q132	IC,(74LS367A)			
Q133	IC,(74LS373)			
Q134	IC,(74LS373)			
Q135	IC,(74LS373)			
Q136	IC,(74LS367A)			
Q137	IC,(74LS373)			
Q138	IC,(74LS373)			
Q139	IC,(74LS373)			
Q140	IC,(74LS74A)			
Q141	IC,(74LS74A)			
Q142	IC,(74S02)			
Q143	IC,(74F175PC)			
Q144	IC,(74F11PC)			
Q145	IC,(74S74)			
Q146	IC,(74S00)			
Q147	IC,(74S04)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
Q148	IC,(74LS161A)			
Q149	IC,(74LS161A)			
Q150	IC,(74LS161A)			
Q151	IC,(74LS393)			
Q152	IC,(74LS161A)			
Q153	IC,(74LS161A)			
Q154	IC,(74LS161A)			
Q155	IC,(74LS393)			
Q156	IC,(74LS74A)			
Q157	IC,(74F10PC)			
Q158	IC,(74F175PC)			
Q159	IC,(74F86PC)			
Q160	IC,(74S51)			
Q161	IC,(74S112)			
Q162	IC,(74S04)			
Q163	IC,(HD10125)			
Q164	IC,(TD62003P)			
Q165	IC,(74LS161A)			
Q166	IC,(74F175PC)			
Q167	IC,(74F175PC)			
Q168	IC,(74F175PC)			
Q169	IC,(74S00)			
Q170	IC,(74S10)			
Q171	IC,(74S74)			
Q172	IC,(74LS293)			
Q173	IC,(74F191PC)			
Q174	IC,(74S74)			
Q175	IC,(74F32PC)			
Q176	IC,(74S74)			
Q177	IC,(74S74)			
Q178	IC,(HD10116)			
Q179	IC,(HD10125)			
R 1	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R 2	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R 3	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R 4	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R 5	CF,(ARD25T561J)	560Ω,±5%,1/4W		
R 6	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 7	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 8	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 9	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R 10	CF,(ARD25T331J)	330Ω,±5%,1/4W		
R 11	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R 12	CF,(ARD25T221J)	220Ω,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram **12**)

CKT REF	DESCRIPTION	RATING		NOTE
R13	CF,(ARD25T181J)	180Ω,±5%,1/4W		
R14	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R15	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R16	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R17	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R18	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R19	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R20	CF,(ARD25T150J)	15Ω,±5%,1/4W		
R21	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R22	CF,(ARD25T271J)	270Ω,±5%,1/4W		
R23	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R24	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R25	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R26	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R27	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R28	CF,(ARD25T333J)	33kΩ,±5%,1/4W		
R29	CF,(ARD25T333J)	33kΩ,±5%,1/4W		
R30	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R31	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R32	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R33	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R34	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R35	CF,(ARD25T220J)	22Ω,±5%,1/4W		
R36	CF,(ARD25T391J)	390Ω,±5%,1/4W		
R37	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R38	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R39	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R40	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R41	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R42	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R43	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R44	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R45	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R46	CF,(ARD25T105J)	1MΩ,±5%,1/4W		
R47	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R48	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R49	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R50	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R51	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R52	Var,MF,(RJ-6P 2kΩ)	2kΩ,1/2W		
R53	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R54	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R55	CF,(ARD25T391J)	390Ω,±5%,1/4W		
R56	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R57	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R58	CF,(ARD25T182J)	1.8kΩ,±5%,1/4W		

( ): Manufacturer's part number
* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
R59	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R60	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R61	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R62	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R63	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R64	CF,(ARD25T330J)	33Ω,±5%,1/4W		
R65	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R66	CF,(ARD25T181J)	180Ω,±5%,1/4W		
R67	CF,(ARD25T822J)	8.2kΩ,±5%,1/4W		
R68	CF,(ARD25T123J)	12kΩ,±5%,1/4W		
R69	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R70	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R71	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R72	CF,(ARD25T330J)	33Ω,±5%,1/4W		
R73	CF,(ARD25T331J)	330Ω,±5%,1/4W		
R74	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R75	CF,(ARD25T682J)	6.8kΩ,±5%,1/4W		
R76	CF,(ARD25T153J)	15kΩ,±5%,1/4W		
R77	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R78	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R79	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R80	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R81	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R82	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R83	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R84	CF,(ARD25T391J)	390Ω,±5%,1/4W		
R85	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R86	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R87	CF,(ARD25T392J)	3.9kΩ,±5%,1/4W		
R88	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R89	CF,(ARD25T122J)	1.2kΩ,±5%,1/4W		
R90	CF,(ARD25T272J)	2.7kΩ,±5%,1/4W		
R91	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R92	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R93	CF,(ARD25T105J)	1MΩ,±5%,1/4W		
R94	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R95	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R96	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R97	CF,(ARD25T332J)	3.3kΩ,±5%,1/4W		
R98	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R99	Not assigned			
R100	Not assigned			
R101	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R102	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R103	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		
R104	CF,(ARD25T472J)	4.7kΩ,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
R105	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R106	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R107	CF,(ARD25T682J)	6.8kΩ,±5%,1/4W		
R108	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R109	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R110	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R111	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R112	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R113	CF,(ARD25T391J)	390Ω,±5%,1/4W		
R114	Var,MF,(RJ-6P 1kΩ)	1kΩ,1/2W		
R115	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R116	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R117	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R118	CF,(RS2FB470J)	47Ω,±5%,2W		
R119	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R120	CF,(ARD25T221J)	220Ω,±5%,1/4W		
R121	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R122	Not assigned			
R123	Not assigned			
R124	MF,(RN14K2E1000D)	100Ω,±0.5%,1/4W		
R125	MF,(RN14K2E1000D)	100Ω,±0.5%,1/4W		
R126	MF,(RN14K2E3010D)	301Ω,±0.5%,1/4W		
R127	MF,(RN14K2E3010D)	301Ω,±0.5%,1/4W		
R128	Var,MF,(RJ-6P 500Ω)	500Ω,1/2W		
R129	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R130	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R131	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R132	Var,MF,(RJ-6P 500Ω)	500Ω,1/2W		
R133	CF,(ARD25T511J)	510Ω,±5%,1/4W		
R134	CF,(ARD25T222J)	2.2kΩ,±5%,1/4W		
R135	CF,(ARD25T681J)	680Ω,±5%,1/4W		
R136	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R137	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R138	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R139	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R140	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R141	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R142	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R143	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R144	Var,MF,(RJ-6P 5kΩ)	5kΩ,1/2W		
R145	Var,MF,(RJ-6P 2kΩ)	2kΩ,1/2W		
R146	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R147	CF,(ARD25T272J)	2.7kΩ,±5%,1/4W		
R148	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R149	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R150	CF,(ARD25T151J)	150Ω,±5%,1/4W		

I

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
R151	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R152	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R153	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R154	CF,(ARD25T151J)	150Ω,±5%,1/4W		
R155	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R156	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R157	Var,MF,(RJ-6P 5kΩ)	5kΩ,1/2W		
R158	Var,MF,(RJ-6P 2kΩ)	2kΩ,1/2W		
R159	CF,(ARD25T821J)	820Ω,±5%,1/4W		
R160	CF,(ARD25T272J)	2.7kΩ,±5%,1/4W		
R161	CF,(ARD25T750J)	75Ω,±5%,1/4W		
R162	Not assigned			
R163	Not assigned			
R164	Not assigned			
R165	Not assigned			
R166	Not assigned			
R167	Not assigned			
R168	CF,(ARD25T224J)	220kΩ,±5%,1/4W		
R169	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R170	CF,(ARD25T224J)	220kΩ,±5%,1/4W		
R171	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R172	CF,(ARD25T154J)	150kΩ,±5%,1/4W		
R173	CF,(ARD25T224J)	220kΩ,±5%,1/4W		
R174	CF,(ARD25T104J)	100kΩ,±5%,1/4W		
R175	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R176	CF,(ARD25T104J)	100kΩ,±5%,1/4W		
R177	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R178	Not assigned			
R179	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R180	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R181	CF,(ARD25T154J)	150kΩ,±5%,1/4W		
R182	CF,(ARD25T392J)	3.9kΩ,±5%,1/4W		
R183	CF,(ARD25T392J)	3.9kΩ,±5%,1/4W		
R184	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R185	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R186	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R187	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R188	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R189	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R190	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R191	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R192	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R193	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R194	CF,(ARD25T471J)	470Ω,±5%,1/4W		
R195	CF,(ARD25T101J)	100Ω,±5%,1/4W		
I R196	CF,(ARD25T102J)	1kΩ,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-10 COMPONENT LIST FOR ERROR DETECTION CIRCUIT (422U10849 P.C. BOARD), (Receiver Z3 Circuit Diagram 12)

CKT REF	DESCRIPTION	RATING		NOTE
R197	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R198	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R199	CF,(ARD25T102J)	1kΩ,±5%,1/4W		
R200	CF,(ARD25T101J)	100Ω,±5%,1/4W		
R201	Single in-line array, (IHR-8-103JA)	10kΩ x 8,1/8W		
R202	CF,(ARD25T220J)	22Ω,±5%,1/4W		
R203	CF,(ARD25T220J)	22Ω,±5%,1/4W		
R204	CF,(ARD25T103J)	10kΩ,±5%,1/4W		
R205	CF,(ARD25T331J)	330Ω,±5%,1/4W		
R206	CF,(ARD25T152J)	1.5kΩ,±5%,1/4W		

( ): Manufacturer's part number

* : Selected at factory

Table 4-11 COMPONENT LIST FOR FRONT PANEL CIRCUIT (422U10872 P.C. BOARD), (Receiver Z4 Circuit Diagram 13)

CKT REF	DESCRIPTION	RATING		NOTE
C 1	Elect,(CE04C1A101)	100μF,±20%,10V		
C 2	Elect,(CE04C1A470)	47μF,±20%,10V		
C 3	Elect,(CE04C1A101)	100μF,±20%,10V		
J 1	Connector, (HIF23A-40D-AA10S)			
Q 1	LED,(LN513GA)			
Q 2	LED,(LN513GA)			
Q 3	LED,(LN513GA)			
Q 4	LED,(LN513GA)			
Q 5	LED,(LN513GA)			
Q 6	LED,(LN513GA)			
Q 7	LED,(LN513GA)			
Q 8	LED,(LN513GA)			
Q 9	LED,(LN514GA)			
Q10	LED,(LN514GA)			
Q11	LED,(LN514GA)			
Q12	LED,(LN514GA)			
Q13	LED,(LN514GA)			
Q14	LED,(LN442YPH)			
Q15	LED,(LN442YPH)			
Q16	LED,(LN442YPH)			
Q17	LED,(LN442YPH)			
Q18	LED,(LN442YPH)			
Q19	LED,(LN242RPH)			
Q20	LED,(LN242RPH)			
Q21	LED,(LN242RPH)			
Q22	LED,(LN242RPH)			
Q23	LED,(LN442YPH)			
Q24	LED,(TLG226)			
Q25 to Q44	Tr,(2SA1154)			
Q45	Tr,(2SC2901)			
Q46	Tr,(2SC2901)			
Q47	LED,(TLG226)			
Q48	LED,(TLG226)			
Q49	LED,(TLG226)			
Q50	IC,(74LS42)			
Q51	IC,(74LS42)			
Q52	IC,(μPA79C)			
Q53	IC,(μPA79C)			
Q54	IC,(74LS138)			

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( ): Manufacturer's part number

* : Selected at factory

Table 4-11 COMPONENT LIST FOR FRONT PANEL CIRCUIT (422U10872 P.C. BOARD), (Receiver Z4 Circuit Diagram 13)

CKT REF	DESCRIPTION	RATING		NOTE
Q55	IC, (74LS10)			
R 1	Single in-line array, (IHR-8-332JA)	3.3kΩ x 8, 1/8W		
R 2	Single in-line array, (IHR-8-332JA)	3.3kΩ x 8, 1/8W		
R 3	Single in-line array, (IHR-7-330JB)	33Ω x 7, 1/8W		
R 4	Single in-line array, (IHR-7-220JB)	22Ω x 7, 1/8W		
R 5	Not assigned			
R 6	Single in-line array, (IHR-7-330JB)	33Ω x 7, 1/8W		
R 7	Single in-line array, (IHR-8-103JA)	10kΩ x 8, 1/8W		
R 8	Not assigned			
R 9	Single in-line array, (IHR-7-331JB)	330Ω x 7, 1/8W		
R10	Single in-line array, (IHR-7-331JB)	330Ω x 7, 1/8W		
R11	Single in-line array, (IHR-7-331JB)	330Ω x 7, 1/8W		
R12	Single in-line array, (IHR-4-103JA)	10kΩ x 4, 1/8W		
R13	Single in-line array, (IHR-6-103JA)	10kΩ x 6, 1/8W		
R14	CF, (ARD25T330J)	33Ω, ±5%, 1/4W		
R15	CF, (ARD25T102J)	1kΩ, ±5%, 1/4W		
R16	CF, (ARD25T220J)	22Ω, ±5%, 1/4W		
R17	CF, (ARD25T471J)	470Ω, ±5%, 1/4W		
R18	CF, (ARD25T331J)	330Ω, ±5%, 1/4W		
R19	Single in-line array, (IHR-4-103JA)	10kΩ x 4, 1/8W		
R20	CF, (ARD25T102J)	1kΩ, ±5%, 1/4W		
S 1	Switch, (HL20-LSAB)			
S 2	Switch, (HL20-LSAB)			
S 3	Switch, (HL20-LSAB)			
S 4	Switch, (HL20-LSAB)			
S 5	Switch, (HL20-LSAB)			
S 6	Switch, (HL20-NS)			
S 7 to S20	Switch, (HL20-LSAB)			
S21	Switch, (HL20-NS)			

( ): Manufacturer's part number

* : Selected at factory

Table 4-11 COMPONENT LIST FOR FRONT PANEL CIRCUIT (422U10872 P.C. BOARD), (Receiver Z4 Circuit Diagram 13)

CKT REF	DESCRIPTION	RATING		NOTE
S22	Switch, (HL20-NS)			
S23	Switch, (HL20-LSAB)			
S24	Switch, (HL20-LSAB)			
S25	Switch, (HL20-LSAB)			
S26	Switch, (HL20-NS)			
S27	Switch, (HL20-NS)			
S28	Switch, (HL20-LSAB)			
S29	Switch, (HL20-LSAB)			
S30	Switch, (HL20-LSAB)			
S31	Switch, (HL20-LSAB)			
S32	Switch, (HL20-LSAB)			
S33	Switch, (HL20-LSAB)			
S34	Switch, (HL20-LSAB)			
S35	Switch, (HL20-LSAB)			
S36	Switch, (HL20-LSAB)			
S37	Switch, (HL20-LSAB)			
S38	Switch, (HL20-NS)			

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( ): Manufacturer's part number

* : Selected at factory

Table 4-12 COMPONENT LIST FOR SWITCH CIRCUIT (422U79287 P.C. BOARD), (Receiver Z8 Circuit Diagram 14)

CKT REF	DESCRIPTION	RATING		NOTE
J 1	Connector, (DF1-10P-2.5DSA)			
S 1	Switch,(DIP-A(8))			

( ): Manufacturer's part number

* : Selected at factory

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